

XII. *On the Lepidoptera of the Altai Mountains.* By
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[Read June 7th, 1899.]

PLATES XI—XIV.

I.

RHOPALOCERA.

THERE is probably no great range of mountains in Asia which has been so unaccountably neglected by modern naturalists, as those which form the boundary between Siberia and Mongolia, and which comprise the western end of what are known as the Altai and Sayansk Mountains. Their outlying spurs were partially explored in the last century by Pallas, and in the middle of the present one have been visited by several Russian and German geologists and botanists, among whom Helmersen,* Ledebour,† and Tchihatcheff,‡ are, as far as I know, the only ones who have published their travels in German and French. In the Russian language there is no doubt a quantity of literature relating to the natural history of these mountains, which must unfortunately remain unknown to the great majority of foreigners. The only entomologist, however, who has published anything of much value on the Lepidoptera of these mountains is Lederer,§ whose account of the collections made by Kindermann in the years 1852 and 1853 in the extreme western part of the Altai range is very useful. He enumerates 108 species of Rhopalocera of which, however, only 8 or 10 are species not found in Europe. Quite recently Herr Ruckbeil, a well-known collector employed by Herr Rudolph Tancre, spent three seasons in the neighbourhood of the Saisan lake and at Katun-Karagai and Tchingistai, which are a little to the

* Von Helmersen, *Reise nach dem Altai, im Jahre 1834*. St. Petersburg, 1848.

† Ledebour, *Reise durch das Altai-Gebirge*. Berlin, 1829.

‡ Tchihatcheff, *Voyage Scientifique dans L'Altai Orientale*. Paris, 1845.

§ *Lepidopterologisches aus Sibirien*. *Verh. Zool. Bot. Ges. Wien.*, 1853, pp. 1—36 (*sep.*). *Weiterer Beitrag zur Schmetterlings-Fauna des Altai gebirges in Sibirien*. *op. cit.* 1855, pp. 97—120.

south and west of the district explored by Kindermann. Though nothing has been published as to his collection, I am able, through the kindness of Herr Tancré, to give a list of the Rhopalocera, which includes several species not found by Kindermann, most of which appear to belong rather to the fauna of Turkestan than to that of the Altai.

The butterflies of the ranges to the south and west of the Altai, known as the Alatau, are fairly well-known from the collections made by Haberhauer and others; but of those of the whole central and eastern Altai we were quite ignorant.

When the opening of the Siberian railway made it possible to reach the country in a reasonable time, without a winter sledge journey of several weeks' duration, I determined to visit Siberia; partly with the object of hunting the great wild sheep (*Ovis ammon*, Pall.) which is found on the Mongolian frontier, and partly with the hope of adding something to our knowledge of the butterflies, birds, and plants of Asia, whose geographical distribution and variation has always been my favourite study. I was also very anxious to see whether there was any evidence of a boundary line between the eastern and western Holarctic regions, and to reach if possible the sources of the Yenesei river, which was thought by my late friend, Mr. H. Seeböhm, to be the probable line of demarcation between the birds of eastern and western Siberia.*

I was fortunate enough to find a most excellent companion in Mr. W. A. L. Fletcher, who had previously accompanied Mr. and Mrs. Littledale on their celebrated journey through Tibet, and who, though his principal object was to hunt big game, very kindly assisted me in collecting on the journey to and from the hunting ground.

I cannot find that any English traveller except Atkinson has ever written anything about the part of the country we visited, but before giving a sketch of the route and the nature of the country in which my collections were made, I must acknowledge the kind assistance I received from M. Serge Alphéraky, who introduced me to a Russian naturalist, M. Berezowsky, who accompanied us as far as the last Russian outpost, and would, if he had remained with us, have given me much needed assistance in interpreting and collecting. As, however, he left us at Kuch Agatch,

* Cf. H. J. Elwes on Zoology and Botany of Altai Mountains, Linn. Soc. Journ. Zool. vol. xxvii, pp. 23—46, 1898.

I was unable to find time to do as much as I hoped in other branches of zoology; and the difficulties of the country and the languages were such that we were obliged to confine our journey to much narrower limits than we had planned.

M. P. P. Semenov, President of the Entomological Society of St. Petersburg, also gave me much kind help and advice; and General Bolderoff, the Governor of the Altai, was also most obliging in furthering our objects. We left Moscow on May 19th, in quite summer weather, which, however, only lasted as far as the Ural Mountains. At Kazan we spent a few hours and found several butterflies, including *P. machaon*, *Arg. selenis* and *dia*, already on the wing. In the great Barabinsky steppe, through which we passed in the train for two days, there was not a green leaf to be seen on the birch trees, and the only butterfly I saw was *Pieris chloridice*. At Obb, where we arrived on May 26th, it was still quite cold, and the only butterflies were a few hibernated *G. rhamni* and *Vanessas*, besides *L. sinapis*.

Here we left the railway, and went up the Obb river by steamer to Barnaoul, the capital of the Altai district and the only town of importance in it. From here we drove across more or less cultivated and mostly open country to Biisk, where we arrived on June 2nd, and found the birches and poplars just bursting into leaf. The spring was said to be exceptionally late, from fifteen to twenty days behind the usual time. Up to this point I had seen no sign of real mountains, and the patches of forest were small and stunted; but from the earth cliffs above Biisk, we could see the outlying spurs of the real Altai Mountains. After four days' delay, during which I caught a few butterflies, such as *Lycæna argiades*, *Argynnis dia*, *Papilio machaon*, *Polyommatus amphidamas* and *Anthocharis cardamines*, we at last got off on June 6th, and reached a big village called Altaisk, after ten hours' driving in a wickerwork country cart, the only vehicle which can get over such roads as are found beyond Biisk. The weather continued cold and cloudy, and during the four days we took to reach Ongodai I got very few insects, though the flora, scenery, and country were of a very much more attractive character than anything we had hitherto seen. Larch is the prevailing tree of this part of the Altai Mountains, with spruce in the marshy bottoms, and extremely luxuriant herbaceous vegetation everywhere except on the dry southern

exposures of the hillsides. A day before reaching Ongodai, the valleys opened out very much into wide steppe-like flats, on which thousands of horses were grazing, and the last Russian villages ceased. Beyond Sheballina there are hardly any Russian settlers, except a few merchants; and Tartars, who speak a language closely akin to Turkish, and live a nomadic life, are the only inhabitants. At Ongodai we had another delay of four days, whilst waiting for horses, as beyond this point everything has to be packed on horseback. This village is a very promising place for a collector, lying at an elevation of about 3000 feet, and close to well-wooded valleys running up into mountains at least 6000 feet high.

The weather here began to be quite warm, and though butterflies were still scarce, I got some very good species which I had not expected, among them *Pamphila argyrostigma*, Eversm., and *Encis sculda*, both of which were new to Western Siberia.

A Russian entomologist, M. Alexis Jacobson, joined us here and stayed at Ongodai for two months. As he was good enough to send me his collection of *Rhopalocera*, I am able to form a good idea of the butterflies of this part of the Altai, and to add several species to the list of those I took myself.

We left Ongodai on June 14th, and marched about 250 versts in seven days, crossing the deep hot valley of the Katuna river on the second day, then over a pass of about 5000 feet to avoid a gorge in the Katuna valley, to a place called Ena, where the scenery was very peculiar, and thence up the valley of the Tchuja river for five days to Kuch Agatch.

My collecting was of course very much confined to the line of march, but I always kept a man with me to hold my horse, and dismounted whenever I saw a likely spot or an insect I wanted. The sun was very intermittent, and on most days we had thunderstorms; but in the valley of the Tchuja I got many good butterflies, especially near Aibulak at about 4000 feet elevation, where *Thecla fridvaldszkyi* and *Erebia edla* and a very large and distinct species of *Encis* were taken. In the steppe of Kurai, which is surrounded with high snowy mountains, the only abundant insect was *Triphysa phryne*; and when we ascended to the gorge between it and the Upper Tchuja Steppe, we found great banks of snow still unmelted in the valley at Kuyuktana, and vegetation extremely backward; but a new

Lycæna, which I found more common in the higher mountains south of the steppe, showed that we were getting into a good and new region.

In the Tchuja Steppe, which is a large plain surrounded by mountains 8000 to 9000 feet high, interspersed with marshes, salt lakes, and stony plains covered with a scanty grass, I found no insects out as yet, except an occasional straggler of *Pieris chloridice*. At Kuch Agatch, a frontier trading post, we hired fresh horses and men for a month, and started up a valley which runs into the high mountains on the Mongolian frontier, to hunt wild sheep which were very numerous about thirty miles south of Kuch Agatch. For the first ten days bad weather and the attractions of stalking prevented my doing much entomology; but on July 3rd, butterflies began to get so numerous and interesting, that I only hunted when the weather made collecting impossible. Near our camp, which was about 7000 feet elevation, and several miles beyond the last stunted larch trees, which here find their highest limit at about 6800 feet, I got many very interesting species which were quite unexpected and unknown, except from the Upper Amur and Eastern Sayansk Mountains. The hills were immense downs, covered with dry wiry grass, and intersected by rocky gorges with marshy and gravelly flats, and ran up into steep rocky mountains whose slopes were covered with shale and boulders, and whose tops were often flat, and reminded me of the high fjelds of Norway. Peat, and the plants which grow on peat in all similar mountain ranges which I have visited in Northern Europe and America were absolutely wanting; but I found several insects such as *Argynnis freija* and *frigga* which in other countries are associated with peat bogs, in wet grassy flats and by the side of Alpine rivulets.

The weather continued until July 22nd to be very changeable, and though often quite hot in the sun, the latter rarely remained out for more than two or three hours, and hardly a day passed without severe thunder, hail, or snowstorms. By making the most of every glimpse of sunshine, I was now able to add rapidly to my collection, and got good series of many rare species which I did not find elsewhere. On July 13th, in a valley near our camp on the Darkoti or Tachety river, which was full of a greater number of beautiful Alpine plants than I ever saw in one spot before, I first saw the rare *Parnassius evermanni*, and though a fall

on my head from a pony which was not used to a butterfly-net, hindered my work a good deal for a week, by the time we got back to Kuch Agatch on July 19th, I had nearly 1000 specimens.

The steppe was now covered with a large locust, which flew up in hundreds when disturbed, but the only butterflies I found on it were *Satyrus autonoë* in great abundance, and *Lycæna cyane*, which was nearly over. On the marshy banks of the Tchuja river I got a few *Argynnis* and *Ceanonympha*, but the weather was again very cold for two days, and a snowstorm on July 19th covered the mountains to a depth of nearly a foot on the higher levels. On almost every clear night during our stay in the Tchuja Mountains it froze, and in consequence few or no night-flying moths were taken. Retracing our steps for two days to Kurai, I found a great many species which I had not seen before, and on the 23rd turned north from Kurai, over a high pass which leads to a valley running into the Bashkaus river; at the head of this valley I found one of the best places for collecting I have ever seen, and got into quite a new climate and vegetation, much damper than that of the Tchuja valley. To give an idea of what was to be found here, I copy from my diary as follows:—

“July 24th.—Marched about 20 miles over a pass about 8000 feet high into a wooded valley, and encamped at about 5000 feet on a tributary of the Bashkaus. A dull day, but warm and still, and a few gleams of sunshine after 12. Collected—

24 ♂ 4 ♀ *Erebia kefersteini*.

20 ♂ 20 ♀ *E. maurisius*.

1 ♀ *Erebia* allied to *dabanensis* perhaps new; * 7000 feet.

1 ♂ 1 ♀ *E. euryale*, worn and almost over; 6000 feet.

3 ♂ *E. sedakovi* quite fresh, in larch forest.

7 ♂ 2 ♀ *E. tyndarus*, 7500—7000 feet.

4 ♂ 1 ♀ *E. lappona*, 7000—8000 feet.

1 ♂ *Lycæna astrarche* (the only one seen).

2 ♂ *L. optilete* in willow swamp (the first seen).

1 ♀ *L. eros*.

2 ♂ *L. pheretes*.

1 ♀ *Hesperia comma* (the first seen).

* *E. fletcheri*.

1 ♀	<i>Æneis norona</i> , var. <i>maxima</i> (nearly over).
2 ♂ 1 ♀	<i>Hesperia centaureæ</i> .
1 ♂ 1 ♀	<i>Pieris chrysidice</i> .
6 ♂	<i>Colias palæno</i> in willow swamp (the first seen).
2 ♂	<i>C. melinos</i> (quite over).
1 ♂	<i>Melitæa dictynna</i> .
1 ♂	<i>Parnassius delius</i> .
1 ♀	<i>Melitæa</i> , var. <i>britomartis</i> ?
1 ♀	<i>Æneis sculda</i> .
1 ♂ 1 ♀	<i>Arg. pales</i> , very common at 6000 feet.
5 ♂ 1 ♀	<i>A. aphirape</i> .
5 ♂	<i>Cænonympha iphis</i> .
2 ♂	<i>C. tiphon</i> , small pale var.

The hope of getting more of what I supposed to be a new *Erebia* induced me to halt a day, and retrace my steps to the pass, which entailed a rough ride of four hours. Until twelve o'clock there was little or no sun and only two hours in the afternoon. I was unable to find more of the *Erebia* but got *Parnassius stubbendorfi*, which I had not seen before, as well as *P. eversmanni* and *delius*.

After leaving this camp, we passed through marshy larch forest with dry meadows until we got into the main valley of the Bashkaus, which is here a large river flowing in an open park-like valley, at about 4000 feet elevation. We crossed it by a wooden bridge, and in the evening reached Ulaghan, where the Saisan or chief of the upper Tchuja and Bashkaus districts resides, and where there is a small Russian church, and one or two wooden houses. The chief, however, though a Christian, prefers to live in his *yourt*, a large round, felt-covered wicker-work tent, which forms the movable habitation of Mongols and Kirghiz throughout a large part of Central Asia.

After some delay in getting fresh horses we left Ulaghan on July 27th, a dull day with rain at intervals until 4 p.m. But notwithstanding this some butterflies which I had not met with before were out; *Argynnis ino* was in abundance, and *Erebia ligea* was seen for the first time, after crossing a high ridge covered with larch forest, which forms the watershed between the Bashkaus and the Tchulischman Valleys, which unite ten miles above Lake Teletskoi.

On the next day Fletcher went up into the mountain after roe, and succeeded during his mid-day rest in taking

three specimens of *Argynnis angarensis*, a North and East Siberian species, which is new to the Altai. I descended about 2000 feet into the dry rocky gorge of the Tchulischman, where I found a very much warmer climate than I had experienced for six weeks, and a number of butterflies new to me among them; the most interesting were *Pararge deidamia*, and a *Thecla* which I supposed to be *T. w. album*, but which turns out to be the Eastern species *T. prunoides*.

This valley is of quite a different character to any I had hitherto seen in the Altai, having steep rocky slopes and precipices on both sides, with waterfalls from the upper slopes, which are wooded with larch.

On July 29th we followed it down for twenty miles, and found the valley open out again as it approached its junction with the Bashkaus into grassy plains, with rich grass, and in some places a little cultivation of spring rye, the first signs of agriculture I had seen for six weeks.

After crossing the Bashkaus by a ferry, the horses being swum over this large and rapid stream, we came to a small settlement where there is a little Russian church; but we saw no Russians, except one or two travelling traders between Kuch Agatch and Lake Teletskoi, which we reached on July 31st.

The valley of the Bashkaus after its junction with the Tchulischman is very beautifully wooded, and the herbaceous vegetation became very rich and luxuriant; but of an East European type, utterly unlike that of the Tchuja Valley, and a number of common European butterflies appeared which I had not seen before. I did not find a single non-European species north of the junction of the Bashkaus, though no doubt the high mountains round Lake Teletskoi, which I had not time to ascend, would produce some of the alpine species of the Altai.

North of the lake, which took us two days' rowing to traverse, we got into a much more densely wooded country, and twenty miles down the Bija Valley, we came to the first Russian village. The valley opens out a good deal, and in some parts is covered with magnificent forests of pine, the largest I have ever seen in Europe or Asia; these, however, are being rapidly wasted by fire and axe, the logs being floated down to supply the villages on the Obb, where there is, as far as I saw, no really fine timber.

The best of the collecting was now over, all the summer

butterflies being much worn, and though I found second broods of *Araschnia levana*, *Lycæna orion*, *Leucophasia sinapis* and others, as well as some common European species I had not hitherto observed, it is quite evident that this part of the country is not to be compared in interest or novelty to the Tchuja Valley.

On August 6th we got to the first Russian post-house, where, although the roads were in places frightfully bad, wheel carriage again became possible, and the change from dense forest-clad hills to an open cultivated country was sudden and remarkable.

In the course of a three days' drive to Barnaoul I took only one butterfly, *Polyommatus virgaureæ*, which I had not previously seen, and reached the railway at Krivostchokovo rather used up, as the terrible jolting, combined with a touch of malarial fever (which seems to be prevalent in autumn in the lower Bija Valley), laid me up for four days before starting for Moscow.

The weather during our journey across the steppe was cloudy or wet, and as there seemed to be no entomological inducement to stay a day or two in the Ural as I had intended, we came right on to Moscow without stopping.

I will now give a complete list of the Lepidoptera I procured, together with those taken by M.M. Jacobson and Berezowsky at Ongodai, and in order to complete the list of species found in the Altai, as far as possible I have added those species recorded by Lederer and Tancreé, and a few others which I found in Dr. Staudinger's collection and in that of M. Grum-Grshimailo, which I purchased at St. Petersburg.

I may add, that all of these come from the south and western district near Semipalatinsk, and possibly a few of them are hardly found north of the Irtysch river, which I take as the boundary of the Altai in that direction.

It must be understood that my list only refers to the Altai Mountains so far as they are in Russian territory. There is a great southern extension of the Altai range in Mongolia which is unknown to entomologists, and some travellers and geographers include the mountains forming the boundary between Central Siberia and Mongolia, and those at the head-waters of the Yenesei river in the Altai system, but I prefer to call these the Sayansk Mountains. Towards the south-west there is no definite boundary except the Irtysch river between the Altai and the

Alatau Mountains, and I am not sure whether I ought to include all the species collected by Ruckbeil, some of which were taken at Saisan in the upper Irtysh Valley. Most of the species characteristic of the Central Asian fauna, such as *Parnassius actius*, *Anthocharis pyrothoë*, *Colias thisoa*, *Oeneis tarpeia*, and *Satyrus heydenreichi*, were only taken by Kindermann and Ruckbeil in the Irtysh Valley and at Saisan; and if they were excluded, my list would show an even more decidedly European and Siberian element than it does now. A large number of the species I collected were only found in the valleys of the Bashkaus, Tchulishman, and Ursul, and not in the high bare mountains south of the Tchuja Steppe, where I spent the most of my time and collected most thoroughly. Here I only took about thirty-six species, and as a list of these will be interesting to show what the really high mountain butterflies are I will give it separately.

The following occurred at 6500 feet, which is about timber-line and upwards:—

<i>Parnassius delius</i> , var. <i>alpina</i> .*	<i>Argynnis aphirape</i> .
A <i>P. eversmanni</i> .*	<i>A. selenis</i> .
<i>Aporia crataegi</i> .	<i>A. pales</i> .
<i>Pieris chloridice</i> .	<i>A. freija</i> .
<i>P. chrysidice</i> (seen once, not identified).	<i>A. frigga</i> , var.
A <i>Colias melinos</i> , var. <i>alpina</i> .*	<i>A. dia</i> , var.
A <i>C. nastes</i> , var. <i>mongola</i> .*	A <i>Erebia kefersteini</i> .
<i>Lycæna ægon</i> .	A <i>E. maurisius</i> .
<i>L. argus</i> .	A <i>E. parmenio</i> .
<i>L. pheretes</i> .	<i>E. lappona</i> .
<i>L. orbitulus</i> .	<i>E. tyndarus</i> .
A <i>L. argali</i> .	A <i>E. ero</i> .
<i>Vanessa urticae</i> .	A <i>Oeneis mulla</i> ?*
<i>Melitea iduna</i> .*	A <i>O. sculda</i> .
<i>M. aurinia</i> , var.	<i>O. bore</i> , var.*
<i>M. cinxia</i> , var.	<i>Cænonympha tiphon</i> , var.
<i>M. aurelia</i> , var.	<i>Triphysa phryne</i> .
A <i>M. arcesia</i> , var.*	<i>Hesperia centaureæ</i> .

This small list is very interesting, as showing the character of the high alpine fauna: eleven of the species are non-European, fifteen are also found in Lapland, and the same number in Amurland; only nine in the Pamir, so that the character of the fauna is essentially boreal rather than Central Asiatic.

* Those marked * were not taken elsewhere. Those marked A do not occur in Europe.

		Altai Mountains, taken by Elwes.		Ongodai, by Jacobson and Berezowsky.	The South-Western Altai, by Kindermann, Ruckbeil, etc.		Thianshan Mountains and Kuldja District, by Alphéraky and Grun.	Tarbagatai, by Haberland.	Alatau, by Haberland.	Pamir, by Grun.	Amur, recorded by Staudinger.	Kentei, by Dorries.	Kokonor, by Grun.	Lena, by Herz.	In Europe.
		1	2	3	4	5	6	7	8	9	10				
1	<i>Papilio machaon</i>	x	..	x	x	x	x	x	x	x	x	x	x	x	x
2	<i>P. podalirius</i>.....	..	..	x	x	x	x	..	..	..	..	..	..	..	x
3	<i>Parnassius apollo</i>	x	x	x	x	x	x	x	..	..	..	x	..	x	x
4	<i>P. delius</i>	x	x	x	..	x	..	..	..	..	..	..	..	x	x
5	<i>P. nomi-n</i>	x	x	x	..	..	..	..	..	..	x	x	x	..	..
6	<i>P. actius</i> .....	..	..	x ?	x	..	..	x	x	..	..	..	..	..	..
7	<i>P. enedius</i> .....	..	..	x	..	..	..	..	..	..	x	x	x	x	..
8	<i>P. clarius</i>	x	..	x	..	x	x	..	..	..	..	..	..	..	..
9	<i>P. stubbendorfi</i>	x	x	x	..	..	..	..	x	..	x	..	x	..	..
10	<i>P. eversmanni</i>	x	..	..	..	..	..	..	x	..	x	..	..	x	..
11	<i>Aporia cratægi</i>.....	..	..	x	x	x	x	..	x	x	x	x	x	x	x
12	<i>Pieris napi</i>	x	x	x	x	x	x	x	..	x	x	x	x	..	..
13	<i>P. rapæ</i>	x	x	x	x	x	x	x	x	x	x	x	x	x	x
14	<i>P. daphidice</i>	x	x	x	x	x	x	x	x	x	x	..	x	..	x
15	<i>P. chlorodice</i>	x	..	x	..	x	..	x	x	..	..	..	x	..	x
16	<i>P. callidice</i>	x	x	..	x	x	x	x	x	..	..	..	x	..	x
17	<i>Anthocharis cardamines</i> ...	x	x	x	x	x	x	x	x	x	x	x	x	x	x
18	<i>A. belia</i> , var.	x	x	x	x	x	x	..	x	..	..	..	..	x	x
19	<i>A. pyrothoë</i> .....	..	..	x	x	..	..	x	..	..	..	..	..	x	x
20	<i>Leucophasia sinapis</i>	x	x	x	x	x	x	..	x	..	x	x	x	x	x
21	<i>Colias palæno</i>	x	..	x	..	..	..	..	..	..	x	x	..	x	x
22	<i>C. nastes</i> ? var. <i>mongola</i> ...	x	..	..	..	..	..	..	..	..	..	..	..	..	..
23	<i>C. melinos</i>	x	..	..	..	..	..	..	..	..	x	x	..	x	..
24	<i>C. hyale</i>	x	x	x	x	x	x	x	x	x	x	x	x	..	x
25	<i>C. chrysotheme</i>	x	x	..	..	..	..	..	..	..	..	x	..	..	x
	<i>C. erate</i> ? .....	..	..	x	x	x	x	x	x	x	x	..	..	..	x
26	<i>C. aurora</i> .....	..	x	x	x	..	..	..	x	x	x	x	..	x	..
27	<i>C. thisoa</i> .....	..	..	x	x	x	..	..	x	..	..	..	x	..	..
28	<i>Rhodocera rhamni</i>	x	..	x	x	..	..	..	..	x ?	x	x	..	..	x
29	<i>Thecla betulæ</i> .....	..	x	x	x	x	..	..	..	..	x	..	..	..	x
30	<i>T. prunoides</i>	x	..	..	..	..	..	..	..	..	..	x	..	..	..
31	<i>T. pruni</i> .....	..	..	x	..	..	..	..	..	..	..	..	..	..	x
32	<i>T. rubi</i>	x	x	x	x	x	x	x	x	x	x	..	..	x	x
33	<i>T. frivaldszkyi</i>	x	..	x	..	..	..	..	..	..	x	..	..	..	..
34	<i>Polyommatus virgaureæ</i> ...	x	x	x	x	..	..	..	x	..	x	x	..	x	x
35	<i>P. thersamon</i>.....	..	..	x	x	x	x	x	x	x	..	..	..	..	x
36	<i>P. hippothoë</i> .....	..	..	x	..	..	..	..	..	..	x	..	..	x	x
37	<i>P. alciphron</i> .....	..	..	? x	x	..	..	..	x	..	..	..	..	..	x
38	<i>P. dorilis</i> .....	..	..	? x	..	..	..	..	x	..	..	..	..	..	x
39	<i>P. dispar</i> , var. <i>rutilus</i> ...	..	..	x	x	x	x	x	x	..	x	x	x	..	x
40	<i>P. phleas</i>	x	..	x	x	x	x	..	x	x	x	..	..	x	x
41	<i>P. amphidamas</i>	x	x	..	..	..	..	x	x	..	x	x	..	x	x
42	<i>Lycæna argiades</i>	x	x	..	x	..	..	..	x	x	x	x	..	x	x
43	<i>L. fischeri</i>	x	x	x	..	x	..	x	..	..	x	..	..	..	..

		Altai, Elves.	Ongodai, Jacobson & Berezowsky.	South-Western Altai, Kindermann & Ruckbeil.	Thianshan & Kuldja, Alphéraky & Grun.	Tarbagatai, Haberhauser.	Alatau, Haberhauser.	Pamir, Grun.	Amur, Staudinger.	Kentei, Dorries.	Kokonor, Grun.	Lena, Herz.	In Europe.
		1	2	3	4	5	6	7	8	9	10		
90	<i>Melitæa aurinia</i>	x	x	x	x	x	x	..	x	x	x	x	x
91	<i>M. cinxia</i>	x	x	x	x	x	x	..	..	x	..	x	x
92	<i>M. arduinna</i> .....	..	..	x	x	x	x	x	..	..	..	..	x
	<i>M. trivia</i> ? .....	..	..	x	..	..	..	x	..	..	..	..	x
93	<i>M. phæbe</i>	x	..	x	x	x	x	..	x	x	..	x	x
94	<i>M. didyma</i>	x	x	x	x	x	x	x	x	x	x	..	x
95	<i>M. dictynna</i>	x	x	x	..	..	..	..	x	x	..	..	x
96	<i>M. arcesia</i> , var.	x	x	..	..	..	..	..	x	x	x	x	..
97	<i>M. aurelia</i> , var.	x	x	x	..	x	x	..	x	x	..	?	x
	<i>M. aurelia</i> , var. vel. n.sp.	x	..	..	..	..	..	..	..	..	..	..	..
98	<i>Argynnis aphirape</i>	x	x	..	..	..	..	..	x	x	..	x	x
99	<i>A. selene</i>	x	x	..	..	..	..	..	x	x	..	x	x
100	<i>A. selenis</i>	x	x	..	..	..	..	..	x	x	..	x	x
101	<i>A. osecurus</i> .....	..	x	..	..	..	..	..	x	x	..	x	..
102	<i>A. euphrosyne</i>	x	x	..	..	..	..	..	x	x	..	x	..
103	<i>A. freija</i> , var.	x	..	..	..	..	..	..	x	x	..	x	x
104	<i>A. pales</i>	x	x	x	x	x	x	x	x	x	x	x	x
105	<i>A. var. ? arsilache</i>	x	..	..	..	..	..	..	?	?	..	x	x
106	<i>A. dia</i>	x	..	..	..	x	x	..	..	..	..	x	x
107	<i>A. amathusia</i>	x	x	x	..	..	..	..	x	x	..	..	x
108	<i>A. angarensis</i>	x	..	..	..	..	..	..	x	x	..	x	..
109	<i>A. frigga</i> , var.	x	..	..	..	..	..	..	..	..	..	x	x
110	<i>A. thore</i>	x	..	..	..	..	..	..	x	x	..	x	x
111	<i>A. ino</i>	x	x	x	x	x	x	..	x	x	..	x	x
112	<i>A. daphne</i> .....	..	x	x	..	..	..	..	..	x	..	..	x
113	<i>A. hecate</i>	x	x	x	..	..	x	x	..	..	..	..	x
114	<i>A. lathonia</i> .....	..	..	x	x	x	x	x	..	..	..	..	x
115	<i>A. aglaia</i>	x	x	x	x	x	x	x	x	x	x	x	x
116	<i>A. niobe</i>	x	x	x	x	..	x	..	x	..	x	x	x
117	<i>A. adippe</i>	x	x	x	x	x	x	x	x	x	..	x	x
118	<i>A. paphia</i>	x	..	x	x	..	x	..	x	x	..	..	x
119	<i>A. pandora</i> .....	..	..	x	x	..	x	x	..	..	..	..	x
120	<i>Melanargia iapygia</i> , var. .	..	..	x	x	x	x	..	..	..	..	..	x
121	<i>Erebica maurisius</i>	x	x	x	..	x var.	..	..	..	..	..	x var.	..
122	<i>E. theano</i>	x	x	x	..	..	..	..	..	..	..	..	..
123	<i>E. kefersteini</i>	x	x	..	..	..	..	..	..	..	..	..	..
124	<i>E. tyndarus</i>	x	x	..	..	x	..	..	..	..	..	..	x
125	<i>E. aethiops</i>	x	..	x	..	..	..	..	..	..	..	..	x
126	<i>E. sedakovii</i>	x	x	..	..	..	..	..	x	x	..	..	..
127	<i>E. ligea</i>	x	x	x	..	..	..	..	x	..	..	x	x
128	<i>E. euryale</i>	x	x	..	..	..	..	..	..	..	..	x	x
129	<i>E. lapponu</i>	x	..	x	..	..	..	..	..	..	..	..	x
130	<i>E. flit heri</i>	x	..	..	..	..	..	..	..	..	..	..	..
131	<i>E. rossii</i> , var. <i>ero</i>	x	..	..	..	..	..	..	x	..	..	..	..
132	<i>E. edda</i>	x	..	..	..	..	..	..	x	..	..	x	..
133	<i>E. afra</i> .....	..	..	x	..	x	x	..	..	..	..	..	x
134	<i>E. cyclopius</i> .....	..	..	x	..	..	..	..	x	x	..	..	..
	<i>E. medusa</i> .....	..	..	?	..	..	..	..	x	x	..	x	x
135	<i>E. embla</i>	x	..	..	..	..	..	..	x	x	..	x	x

		Altai, Elwes.	Onzodai, Jacobson & Berezowsky.	South-Western Altai, Kindermann & Ruckbeil.	Thianshan & Kuldja, A'phérsky & Grun.	Terlagatai, Haberlauer.	Alatau, Haberlauer.	Pamir, Grun.	Amur, Staudinger.	Kel'tei, Dorries.	Kokonor, Grun.	Lena, Herz.	In Europe.
				1	2	3	4	5	6	7	8	9	10
136	<i>Erebomorpha parmenio</i>	x	x	...	...	...	...	...	x	x	...	...	...
137	<i>Encis mulla?</i>	x	...	...	...	x	...	...	...	...	...	...	...
138	<i>E. norna</i> , var. <i>altaica</i>	x	...	x	...	...	...	...	...	...	...	...	...
139	<i>E. dubia</i>	x	x	...	...	...	...	...	...	...	...	...	...
140	<i>E. nanna</i>	x	...	...	...	...	...	...	x	...	...	...	...
141	<i>E. sculda</i>	x	...	...	...	...	...	...	x	...	...	...	...
142	<i>E. bore</i> , var. <i>ammon</i>	x	...	? var.	...	? var.	...	...	...	? var.	...	...	...
143	<i>E. tarpeia</i> .....	...	...	x	x	x	...	...	...	...	...	...	...
144	<i>Satyrus semele</i> .....	...	...	x	...	...	...	...	...	...	...	...	x
145	<i>S. heydenreichi</i> .....	...	...	x	x	x	...	x	...	...	...	...	...
146	<i>S. hippolyte</i>	x	...	x	x	x	x	...	...	x	...	...	x
147	<i>S. antionoë</i>	x	x	x	x	x	x	...	...	x	x	...	...
148	<i>S. anthæ</i> , var. <i>hanifa</i>. .....	...	...	x	x var.	x	x	x var.	...	...	...	...	...
149	<i>S. briseis</i>	x	...	x	x	...	...	x	...	...	...	...	x
150	<i>S. dryas</i>	x	x	x	x	x	x	...	x	x	x var.	...	x
151	<i>S. arethusa</i> .....	...	...	x	x	x	x	...	...	...	...	...	x
152	<i>S. actæa</i> , var. <i>bryce</i> .....	...	...	x	...	...	x	x var.	...	...	x	...	x
153	<i>Pararge mæra</i>	x	...	x	...	x	...	...	...	...	...	...	x
154	<i>P. hiera</i>	x	...	...	...	x	...	...	x	x	...	x	x
155	<i>P. achine</i>	x	...	x	...	...	...	...	x	x	...	...	x
156	<i>P. deidamia</i>	x	x	...	...	...	...	...	x	x	x	...	...
157	<i>Epinephelus lycaon</i>	x	x	x	x	x	x	x	x	x	...	...	x
158	<i>E. hyperanthus</i>	x	x	...	...	...	...	...	x	x	x var.	...	x
159	<i>Cænonympha ædipus</i> .....	...	...	x	...	...	...	...	x	x	...	...	x
160	<i>C. iphis</i>	x	x	...	x var.	x	...	...	x	x	...	x	x
161	<i>C. amaryllis</i>	x	x	x	...	x	...	...	x	x	x	...	...
162	<i>C. hero</i> , var. <i>perseis</i>	x	x	x	...	...	...	...	x	x	...	x	x
163	<i>C. tiphon</i>	x	x	...	...	...	...	...	...	...	...	x	x
164	<i>C. pamphilus</i> .....	...	...	x	x	x	x	x	...	...	...	...	x
165	<i>Triphysa phryne</i>	x	...	...	...	...	...	...	x var.	...	x var.	...	x
166	<i>Carcharodus alcea</i> .....	...	...	x	...	x	x	x	...	...	...	...	x
167	<i>Hesperia orbifer</i> .....	...	x	x	x	...	...	...	x	x	...	...	x
168	<i>H. tessellum</i>	x	x	x	x	x	x	x	...	x	...	...	x
169	<i>H. cribrillum</i>	x	x	...	...	x	x	...	x	x	...	...	...
170	<i>H. malvæ</i>	x	x	x	x	x	x	x	x	x	...	x	x
171	<i>H. serratulæ</i>	x	x	...	...	x	x	...	...	...	...	x	x
172	<i>H. alceus</i>	x	x	...	...	x	x	...	x	x	...	...	x
173	<i>H. centaureæ</i>	x	...	...	...	...	...	...	...	...	...	x	x
174	<i>Thanaos tages</i>	x	...	x	...	...	...	...	x	...	...	...	x
175	<i>Pamphila palæmon</i> .....	...	x	x	...	...	...	...	x	x	...	x	x
176	<i>P. silvius</i>	x	x	x	...	...	...	...	x	x	...	x	x
177	<i>P. argyrostigma</i>	x	x	...	...	...	...	...	x	x	x	...	...
178	<i>Heteropterus morpheus</i>	x	...	...	...	...	...	...	x	...	x var.	...	x
179	<i>Augiades sylvanus</i>	x	...	x	x	...	x	x	x	x	x	...	x
180	<i>Adopva lincola</i>	x	x	x	...	x	...	...	x	x	...	...	x
181	<i>Erynnis comma</i>	x	x	x	x var.	x	...	x	x	x	x var.	x	x

The authorities for the above lists are as follows:—

1. The lists of Kindermann's collections published by Lederer, and MS. list of Ruckbeil's collections sent me by Herr Tancré.

2. The list of Kuldja butterflies published by Alphéraky in 1881, and the list of Grum-Grshimailo's Thianshan collections, published at p. 522 of his *Travels in Central Asia* (printed in Russian), St. Petersburg, 1896.

3. The list of Haberhauer's collection in the Tarbagatai and Alatau, and

4. given by Staudinger in *Stett. Ent. Zeit.*, 1881, p. 256.

5. The list given by Grum-Grshimailo of his collections in the Pamir and surrounding regions in Romanoff's *Memoires*, vol. iv, p. 126-37.

6. The list of Amur butterflies, given by Staudinger in Romanoff's *Memoires*, vol. vi, p. 106-15.

7. The list of Dorries' collections in the Kentei Mountains given by Staudinger in *Iris*, vol. v, p. 304.

8. The list of collections made by Grum in Amdo and the Kokonor district. Same source as No. 2.

9. Herz' list of his collections on the Vitim and Vilui rivers in *Iris*, vol. xi, p. 233.

10. Staudinger's Catalogue. (I may say that I consider that species not found west of the Southern Ural should be considered as Asiatic rather than European.)

The above list of 181 species includes all which are recorded by Kindermann, Ruckbeil and myself, and though it may be increased a little by future collections, yet a comparison with the lists from the Amur, Kuldja and Pamir regions, and with that of the collection made by Dorries in the Kentei Mountains of East Mongolia, shows that there are very few other butterflies in the adjoining regions which can be expected to occur in the Altai.

Out of the whole number about thirty-nine are not found in Europe: of these six are *Parnassius*, only one of which, *P. actius*, is a Central Asian species; the rest are characteristic of Siberia, and all but *clarius* occur in the Amur region. *Anthocharis pyrothoë* is a Central Asian species. Of the eight *Colias* only *thisoa* is Central Asian, the rest are European or forms of European species, except *C. aurora* and *melinos*, which is the Siberian representative of *phicomone*. Of the five species of *Thecla* only *frivaldszkyi* is non-European, and as compared with twenty-four

species in the Amur region, the genus is poorly represented. *Polyommatus* are also scarce, I found none in the higher mountains, and only three in the lower ground, though Kindermann and Ruckbeil seem to have found more in the Buchtarma district. *Lycæna* is well represented by thirty-four species, several of which, however, seem scarce, and only seven are not European. This compares well with the twenty-two species recorded from the Amur region, to which seventeen of the thirty-four extend. In the Pamir region no fewer than fifty-five are recorded, but only thirteen of these are common to the Altai.

Nymphalidæ are poorly represented, *Neptis lucilla* and *Grapta e-album* being the only common species except vanessa *Argynnis* and *Melitæa*. In the latter genus we have eleven, *M. arecia* being the only non-European species. A single species of *Melanargia* occurs but rarely, and was not seen by me. *Argynnis* is very well represented by twenty-two species. Of these *oscarus* and *angarensis* alone are not found in Europe, and both of them seem scarce or local; but *selenis*, which only extends west to Kazan on the Volga, must be also considered Asiatic.

A. aphirape, *pales*, *freijsa*, and *frigga* are all very abundant typical northern species, none of which except *pales* were found by Alphéraky in the Thianshan, or by Grum in the Pamirs. Only nine *Argynnis* are recorded from the former and seven from the latter regions, whilst the Amur region has twenty-two, fifteen of which are common to the Altai. *Erebia* is much better represented than I expected to find it, no fewer than sixteen species being recorded of which I got thirteen myself. *E. medusa* should certainly occur also, as it is found both east and west of the Altai, but is not yet recorded. No fewer than nine of these *Erebias* are not found in Europe, and a tenth, *afra*, is a purely Asiatic type occurring in only one locality in Europe. Of these sixteen species not one is found either in the Thianshan or Pamir lists, and seven only in the Amur list, which proves what I suggested in my last revision of the genus, that the mountains of Southern Siberia form a centre of distribution for this genus only second to the Alps of Europe, and having no connection at all with the mountain ranges of Turkestan. *E. kefersteini*, *maurisius*, *theano*, *sedakovi*, *cyclopius*, *dabunensis*, *ero*, *eldia*, and *parmenio* are characteristic of this

region, though *sedakovi* and *parmenio* extend to the Amur, and *ero* and *edda* to the north-east of Siberia.

Of the genus *Eneis*, no less than six or seven occur, and only one of them, *tarpeia*, is Central Asiatic; but this is a steppe rather than a mountain species. Of the others, *norna* and *bore* are Boreal species, and *sculda*, *mulla* and *nanna* confined to Asia. Of the eight species of *Satyrus* I only found four, the rest being recorded by Kindermann and Ruckbeil, and these seem confined to the south-western parts of the region. All are European except *heydenreichi*, which is Central Asiatic, and none except *dryas* extend to the Amur region. The other genera of *Satyridae* are scarce, none of the small *Epinepheles* which are so common in Central Asia occurring, but *Triphysa phryne* is in abundance. The *Hesperiidae* are mostly European except *C. argyrostigma*.

1. *Papilio machaon*, L.

Only found in the lower parts of the mountains. It was just appearing at Biisk on June 2nd, fresh in the Tchuja Valley at about 4000 feet on June 18th, and not seen again till August 7th, when one or two worn-out females were taken on the Bija river. The specimens are quite European in type.

2. *P. podalirius*, L.

Recorded by Kindermann and Ruckbeil, not seen by me.

3. *Parnassius apollo*, L., and var. *sibirica*, Nordm. = *Graslini*, Oberthür.

Common in the Bashkaus, Tchulishman and Bija Valleys at the end of July, from about 4500 down to 1000 feet, where I last saw worn females on August 3rd. It flies on and below rocky slopes, where its food plant *Sedum ewersi*? is abundant.

I am doubtful whether *sibirica* can be looked on as a marked variety, in the Altai at any rate. Though some of the males have more dark scales, and perhaps a slightly whiter ground colour than in Europe, and average much larger than alpine specimens, yet Scandinavian examples which ought to be typical *apollo* are hardly distinguishable. In the female sex the difference is, however, much more striking, the black scales being more abundant, and

the markings more diffused. The most typical *sibirica* I have come from near Orenburg. The Asiatic form has usually been called *hessebolus*, Nordmann, but Staudinger in *Iris*, v, p. 304-5, states that this name should be applied to the form from the Kentei Mountains in Central Mongolia (the most easterly locality in which *apollo* has been taken), which differs principally in having the black spots and markings of the fore-wing, and also the red ocelli of the hind-wing, smaller than in other forms of *apollo*. I have specimens from the Thianshan from Grun's collection which agree with those from the Altai, except that the males have the lower half of the fore-wing above quite free from dark scales, the outer part of the wing being pure milk-white.

4. *P. delius*, Esp., and var. *intermedius*, Mén.

First seen in the Tchuja Valley near Tchebit at about 4000 feet elevation flying on rocky slopes covered with brushwood, males only being out on June 18th. Common about Darkoti from 6500 up to about 8000 feet on bare stony mountains from July 14th to 18th, when I first took females; also on the pass between Kurai and the Bashkaus at the end of July, when the males were worn out at 6000—7000 feet. *Saxifraga aizoides*, the food plant of the larva in Europe, was common in most places where I took *delius*. The specimens from Tchuja Valley and Kurai Pass were of the form known as *intermedius*, Mén., of which the males differ from the European form only in being of a slightly purer white ground colour; the females, like those of *apollo*, differ in having as a rule much more dark markings and lunules, as in some of the American forms; but after comparing a very large series from various parts of Europe, Asia, and America, I do not see my way to define *intermedius*, because the variation is too great among them. One female from Kurai is darker than any *delius* I have ever seen except from the Irkut Valley, and resembles some of the forms known as *Hermodur* from north America. Another from Ongodai is of a milky-white ground colour with red ocelli as large as those of *nomion*, and some are hardly distinguishable from European specimens.

The form which I took about Darkoti is, however, very unlike these, and might be separated with more

reason than *intermedius*. It resembles those which I took at Laggan in the Rocky Mountains of Alberta Province, British North America, in being much smaller, the males having often no red ocelli on either wing; though some have small ones, and the black lunules are also much reduced, and the whole appearance of the insect is quite different in consequence. This variety might be distinguished as var. *alpestris*, but as it is quite probable that larger numbers from other parts of the Altai might fail to show these differences, I hesitate to add another varietal name in a genus which is already overladen with them. The form found in the East Sayansk Mountains by Leder resembles these rather than *intermedius*.

5. *P. nomion*, F. d. Wald.

First seen at about 5500 feet on July 22nd, afterwards common in the Bashkaus and Tchulishman Valleys at 2000—4000 feet, down to near the south end of Lake Teletskoi flying in the same places as *P. apollo*, from which at first I did not distinguish it on the wing. I found, however, that it is a weaker flying insect, and much easier to kill than *apollo*, which has the strongest body of any butterfly known to me, and is impossible to kill by pinching. Judging from their greater freshness *nomion* comes out later than *apollo*. I took one male, which at first I thought to be a hybrid between *nomion* and *apollo*, as it seemed to combine the markings of both species. However, after reading what Staudinger has written about similar supposed hybrids from the Kentei Mountains, one of which I have in Grum's collection, and noting the fact stated by him that similar aberrations occur in Amurland, where there are no *apollo*, I am uncertain whether mine is a hybrid or not. It certainly has the chequered fringes of the wings almost as distinct as a *nomion*, whilst *apollo* has the fringes unchequered, and this most distinctive character is not mentioned by Staudinger. There is, however, no reason that I can see why the two species should not breed together.

6. *P. actius*, Ev.

Taken at Tchingistai by Ruckbeil, but not seen by Kindermann or myself.

7. *P. tenedius*, Ev.

Also taken at Tchingistai by Ruckbeil, but not by others. According to Herz, it is one of the earliest butterflies to appear in North-East Siberia. A specimen of *delius* in Staudinger's collection from the Altai (ex-coll. Kindermann) has markings which resemble those of *tenedius* to some extent, but I doubt the possibility of hybridism between these species.

8. *P. clarius*, Ev.

Only taken in one place near the west end of the Tchuja Steppe at about 5500 feet, on dry, hot, rocky slopes overgrown with grass, on July 20th. The males were already worn, but the females fresh. I did not distinguish this from *delius* by its flight or appearance till I had the female in my hand, when the pouch at once showed what it was. The inconstant variety known as *dentata* was taken at Justed by Ruckbeil.

9. *P. stubbendorfi*, Mén.

Common on the Kurai Pass on July 25th, at 6000—7000 feet; the males only flying on marshy alpine meadows below steep rocks, with *eversmanni* and *delius*. The only two females I took were much lower down in swampy larch forest. Jacobson also got one or two at Ongodai.

10. *P. eversmanni*, Mén.

I was surprised to find this rare species, hitherto only known from Central and Eastern Siberia, not uncommon in the Altai. I first took it near Darkoti in marshy alpine meadows, below rocks where snow was still lying at 7000 feet on July 13th, but only males were then out; and though I waited four days in this camp for the females I was obliged to leave without getting any. I afterwards got two worn males on the Kurai Pass. It agrees perfectly with Eversmann's type from Kansk, and with those taken by Leder at Podeika, and by Herz on the Vilui and Vitim rivers, and is rather smaller than those from the Amur, where, according to Graeser, its food plant is *Corydalis giganthea*.

11. *Aporia crataegi*, L.

This was one of the most generally distributed butterflies in the districts I visited. I first saw it at 7000

feet on July 9th, and soon became very abundant, not only up to the very tops of the most stony and barest mountains far above any shrubs, where it was associated with *Encis bore* and *Argynnis freija*, the only species which I took as high, but it seemed equally at home in the dense forest country of the Bija Valley. It must have a variety of food plants, or be of a very wandering disposition. I saw no trace of any approach to *A. hippia*.

12. *Pieris napi*, L.

I found this coming out at Biisk on June 4th, at Ongodai on the 13th, in the Tchuja Valley at about 5000 feet on the 20th, all these belonging to the spring brood, though there is much difference amongst them, one male from Ongodai having the black spot in cell 3 as conspicuous as in the summer brood in Europe, and one male from Biisk having the spot on the costa of the hind-wing also well-marked. I saw none in the high bare mountains. In the Bija Valley the first week of August a large summer brood was out, a female of which is tinged with yellow. *P. napi* is found in the far north of Siberia, on the Vitim river, and in Kamtschatka where it assumes the *bryoniæ* form. One of my females of the spring brood from the Tchuja Valley and one from Minusinsk in the Yenesei Valley might be called *bryoniæ*, but I do not think that, except in the Alps of Europe and in Lapland, this form seems to be constant. I have a pair from Altin Emil in the Thianshan collected by Grum-Grshimailo which are hardly distinguishable from *ochsenheimeri*, which seems to represent *bryoniæ* in the high mountains of the Pamir. There is also a form in Grum-Grshimailo's collection named by him *sifanica*, which occurs as a spring brood in the mountains of Amdo in North-East Tibet, and which by the very dark heavily marked veins of the underside seems to be *bryoniæ*, but I have no females of this. I have also some specimens from Kashmir which, though they stand in my collection as a variety of *melete*, are really just as near to *napi*, and I do not yet know how it is possible to separate these two species with certainty.

13. *P. rapæ*, L.

I found this on June 6th at Biisk, and again at the end of July in the Lower Bashkaus and Bija Valleys.

The difference between the two generations is more striking than in any other locality from whence I have the species, except, perhaps, in Italy, and as the variations of *P. rapæ* appear to have been little studied I will mention the most striking ones as far as I know them. In Britain, in Gloucestershire at least, there is little difference between the first brood and the second, either in size or colour of the underside. In Germany, France and Spain the difference is rather greater, and in Germany, Poland, and occasionally in England, we have an aberration of the female which is distinctly yellow both on the upper and undersides. In Algeria, where I found it common in the province of Constantine, and as far south as Biskra in April and May, and also at Gibraltar in April, some of the males are without a trace of the black spot in cell 4 of the fore-wing on the upper-side, and this is also the case in the one taken at Biisk. I have similar males from Beirut and Candahar taken in February. In the Canary Islands *rapæ* does not appear to have been modified by the climate as in the case of *brassicæ*, which has there developed the remarkable form known as *cheiranthi*. In the Alps and Pyrenees, where I have taken the species at from 5000—7000 feet in July, at which elevation it can, I think, be only single-brooded, the underside is rather of the summer than the spring type. A female from Mont Cenis is absolutely indistinguishable from the female of *ergane*, and may be that species. Though I am not aware that *ergane* has been recorded from the Alps or Germany, I noted in the collection of Dr. Nickerl at Prague similar examples. In September a form occurs at Florence, for which I am indebted to Signor Stefanelli, which passes under the name of *manni*; this form is characterised by the greater extension of the black on the apex of the fore-wing in both sexes, and (if these specimens are typical *manni*) by the veins of the hind-wing below being distinctly bordered with black dusting from which the interspaces are quite free. These specimens are so like some of the summer brood of *napi* known as *nappæ*, Esp., from St. Petersburg and Poland, that I really do not know how to separate them with certainty, and one of the males has indications of black at the end of the veins of the hind-wing above which I see in no other specimen of *rapæ*. In Asia the species has a very wide range. I have specimens from Syria

where it appears to be usually quite small. At Bushir in the Persian Gulf, at Quetta and Candahar in Baluchistan the species is common throughout the season; dated specimens collected by Colonel Swinhoe in February, May, August and November are in my collection, and show the seasonal variation on the underside very fairly. From the Southern Caucasus and from Darwaz in Bokhara I have specimens named by M. Alphéraky *canidia*, var. *manni*, but though I presume he considers this a variety of *canidia*, which also occurs in Turkestan under the form named by Staudinger *palæarctica*, I am almost sure that they are forms of *rapæ* and not of *canidia*. On the Lower Amur, in northern China and in Manchuria, and North-East Tibet, the species also occurs, and has been called by Oberthür var. *orientalis*, but I cannot see the slightest reason for distinguishing this form. In North America the species has been introduced and has now spread from Canada to Alabama and North Carolina, where I took it on Roan Mountain at about 5000 feet. A species, or local race of *rapæ*, has been described by Grun-Grshimailo as *tadjika*; he took it in the mountains of Darwaz and Karategin in South-Eastern Bokhara at 9000 feet in June. Whether it is a mountain form peculiar to Central Asia analogous to *P. ochsenheimeri*, which seems to represent *P. napi* in the same region, is doubtful, but it is easily distinguishable from Turkestan specimens of *rapæ* by the markings of the fore-wing in both sexes and by the colour of the female, which has yellowish hind-wings.

14. *P. daphidice*, L.

The first generation of this occurred at Biisk, and I took one in the Tchuja Valley in June. The second generation was found at the end of July in the Bashkaus at 3000 feet, and at Ongodai by Jacobson.

15. *P. chlorodice*, Hb.

First seen on the Barabinsky Steppe on May 24th, and taken at Kurai and on the Tchuja Steppe on June 17th to June 21st. These were small specimens of the first generation. The second brood was out July 21st at 6000 feet, and was also found in the Bashkaus down to about 2000 feet. These only differ in their larger size from those of the first generation.

16. *P. callidice*, var. ? *chrysidice*, H. S.

This was the only *Picris* I found on the high mountains above timber-line, and there it was not at all common. The specimens are variable in size, and there may be two broods, as I have a somewhat worn specimen taken on June 20th, and fresh ones from the Bashkaus taken a month later. They are more like the form from the Pamir and mountains of North Persia and Armenia than the European *callidice*, but I do not see how the line can be drawn between *chrysidice*, *callidice*, and *kalora*, Moore from the Himalayas when a large number are compared, though those from the European Alps are usually more yellowish on the hind-wing below.

17. *Anthocharis cardamines*, L.

Taken at Biisk and Ongodai in the first half of June.

18. *A. belia*, Cr., var.

I found a few males of this fresh out at Ongodai on June 13th, but got no females. They are more like the alpine form *simplonia* in some respects, but the underside of the hind-wing is variegated in a different way. Without a larger series of both sexes I am not able to assign a varietal name to this form.

19. *A. pyrothoë*, Ev.

Taken at Kenderlik by Ruckbeil but not seen by myself; perhaps it should not be included in the Altai list, as Kenderlik is south of the Irtysh river.

20. *Leucophasia sinapis*, L.

I found the first generation of this at Kazan on May 25th, and at Biisk and Ongodai at the beginning of June. The second generation was common in the Bija Valley in the first week in August. They do not differ from European specimens.

21. *Colias palæno*, L.

The only place where I saw this was in a swampy flat overgrown with willows on the north side of the Kurai Pass at about 5000 feet, where it had been out some time, though fresh specimens were still to be found on July 25th. Ruckbeil also procured it in the Southern Altai. The males are

variable in the breadth of the border, and in colour agree with those from the Swiss Alps, var. *europomone*, Ochs., *vide* Staudinger. The underside is perhaps a trifle less yellow (more darkly freckled with green), which character Staudinger (Iris, v, p. 311) gives as distinctive of his var. *orientalis*, of which I have typical specimens from Kentei, and others from Vitim and the Amur. I can see very little reason for separating any of these from the Swiss form. The few I have from Japan have a broader border, and appear to be more worthy of a varietal name.

22. *Colias nastes*, Bdv.? var. *mongola*, Alph., Rom. Mém. ix, p. 188.

I found this interesting form abundant in the mountains south of Kuch Agatch, at about 7000 feet, especially in the broad, flat, gravelly beds of mountain streams which were overgrown with alpine and arctic plants. Here it appeared on July 3rd, and soon became very numerous. Its flight was very quick and jerky close to the ground, but not nearly so strong as that of *melinos*, which kept more to the mountain sides. The type of *mongola* was taken by Leder near Urga, according to Alphéraky, but probably this is an error, as Staudinger says (Iris, viii, p. 345), that Leder collected the specimens labelled Urga by Christoph, in the Changai Mountains, about half way between Uliassutai and Urga. Alphéraky says that this form is between *cocandica*, Ersch., and *maja*, Gr.-Gr., but it seems to me to be hardly distinguishable except by its smaller size from *tamerlana*, Stgr., a dark form of *nastes* found in the Eastern Thianshan. *Maja* is much lighter in colour, and the females especially differ from those of *mongola*.

23. *Colias melinos*, Ev.

This butterfly was first seen at Ongodai, where I caught a pair *in cop.* on June 10th, and others on the 14th and 18th, in wooded valleys at 3000—4000 feet. All these specimens, together with a female which I took on the Bashkaus on July 25th, when it was quite worn out, though variable in size may be distinguished from the numerous specimens I afterwards found on the high Tchuja Mountains by the paler colour of their underside, which agrees with five pairs from the Amur and with others from the Vitim, taken by Herz, and Irkut, taken

by Leder. A large number from the Tchuja Mountains vary considerably in size and colour above, but are all darker below on the hind-wing. They were common from 6000—8000 feet, flying fast over the alpine meadows, and easily distinguished by their much more rapid flight from *mongola*, which appeared to confine itself more to the flat beds of the mountain streams. On comparing these alpine specimens with those in Dr. Staudinger's collection from the Kentei Mountains, they seem hardly distinct enough from the valley form to be named as a variety.

24. *C. hyale*, L.

This was very common in the Katuna Valley at 3000 feet on June 17th, but not seen again until I came down to the low country at the end of July, where it was common in the Bija Valley and in the open country about Biisk in the first week of August.

25. *C. chrysotheme*, Esp.

The first generation of this species came out at Ongodai on June 10th, and in the Tchuja Valley a week later, flying rapidly over bare ground. The second generation, which only differs by being on the average somewhat larger, and not as in America by its deeper colour, was abundant in the Kurai Steppe and Bashkaus Valley at the end of July. A specimen from Krasnoyarsk in Grum-Grshimailo's collection, the type of his (? MS.) var. *sibirica*, is paler, and has more yellow at the apex of the fore-wing, but one from Minusinsk in the Yenesei Valley is like those I took; on the average they are decidedly larger and, I think, somewhat brighter than Austrian and South Russian specimens, and resemble more the form known in America as *keewaydin*, W. H. Edw.

26. *Colias aurora*, Esp.

I did not take this myself, but received several specimens from Ongodai, which average somewhat smaller than those from the Amur; all the females were of the white form. It also occurs in the Yenesei Valley, and is recorded by Ruckbeil from the South Altai. Those from the Kentei Mountains are paler in tint and have narrower borders than mine.

27. *C. thisoa*, Mén., and *C. erate*, Esp.

Both taken by Ruckbeil but not seen by me. I do not know the exact localities where he got them, so perhaps they should not be included, though some species of the *thisoa* group ought to occur in the Altai Mountains.

28. *Rhodocera rhamni*, L.

Hybernated specimens were common from the time I reached the Obb river up to Ongodai, and fresh ones were first seen in the Bija Valley in the beginning of August.

29. *Thecla betulæ*, L.

Not seen by me, but apparently not uncommon early in August at Ongodai, where Jacobson got several specimens not differing from European ones, except that the females show a little less yellow on the fore-wing. A specimen from Lake Teletskoi was in the St. Petersburg Museum.

30. *T. prunoides*, Stgr.

I found this in the valley of the Tchulishman river at about 3000 feet at the end of July, and Jacobson also took it at Ongodai. At first I supposed this to be *W-album*, but on comparing it with Dr. Staudinger's collection, he considers that my specimens are the same as *prunoides* from Amurland. He had one taken by Kindermann at Ust-Kamenogorsk in the South-West Altai. The species is easily distinguished from *W-album* by the absence of the well-marked sexual patch on fore-wing of the male, which is constant in that species.

31. *T. pruni*, L.

Recorded by Kindermann, and I have one from Grum's collection, taken near Semipalatinsk.

32. *T. rubi*, L.

Taken at Biisk, Ongodai, and in the Tchuja Valley up to about 4000 feet in the first half of June.

33. *T. frivaldszkyi*, Led.

I found this in bushy places in the Katuna and Tchuja Valleys, at 3000—4000 feet, in the second week in June. It is evidently an early spring insect, as many of the

examples were already worn. It appears to be common throughout Central Siberia, as Jacobson found it on the Upper Yenesei, Leder on the Irkut, and Trybom on the Lower Yenesei as far north as 64°.

This species is probably more nearly allied to the North American group, of which *T. irus*, Godart, is the best-known representative, than to any European species. This group has been generically separated by Scudder under the name *Incisalia*.

It is quite distinct in my opinion from *Thecla* (*Satsuma*) *ferrea* from Japan, both by the pattern of the underside and by the absence of the sexual patch on fore-wing of male.

34. *Polyommatus virgaureæ*, L.

I only found this in the prairie country near Biisk on August 7th, when it was nearly over, but Jacobson sent two pairs from Ongodai, which do not differ from European specimens. I cannot see any difference between the form from the Kentei Mountains named *virgaureola* by Staudinger, which would justify its separation, though some specimens from that locality are almost without white spots and darker on the hind-wing below.

35. *P. thersamon*, Esp.

Not taken by me, but in Staudinger's collection taken by Kindermann.

36. *P. hippothoë*, L.

The same remarks apply to this as to the last species.

37. *P. alciphron*, Rott.

This and the next species are both recorded by Lederer as taken by Kindermann, but I can find specimens of neither of them in Staudinger's collection, and neither were taken by myself or Jacobson.

38. *P. dorilis*, Hufn.

39. *P. dispar*, var. *rutilus*, Wernb.

Recorded by Herr Tancreé as having been taken by Ruckbeil. Two pairs which he sent me from Kenderlik are like *Sarepta* specimens in size. A form occurs in the Kentei and Chingan Mountains.

40. *P. phlæas*, L.

A single specimen taken at Biisk early in June.

41. *P. amphidamas*, Esp.

Common near Altaisk, and up to about 3000 feet, in the first week of June.

42. *Lycæna argiades*, Pall.

The first generation was common at Biisk in the first week of June, the second, much larger, was out in the Bija Valley the first week in August.

43. *L. fischeri*, Ev.

Very abundant in the valleys of the Katuna and Tchuja from 2500—3500 feet in the middle of June. The species swarmed on wet sand and damp places by the side of the river, where it could often be taken without a net. The second generation, which does not seem appreciably different, appeared at the end of July in the Bashkaus Valley. Jacobson also found it common at Ongodai after I left.

44. *L. ægon*, S. V.

Common at Ongodai and in the Tchuja and Bashkaus Valleys in July. Some of the specimens from Ongodai are very dark on the upper side, and might be considered as a small variety of *cleobis*, Brem., which is found in the Kentei Mountains and Mongolia, and of which I have specimens from Alphéraky from Irkut, and from Uliassutai under the name of var. *ida* Stdr. agreeing fairly with mine. Staudinger also says that he has from Minusinsk a form of *cleobis* nearly approaching *argus*. I do not, however, know of any certain distinction between the three species, though a majority of them can be recognized, and *cleobis* seems darker below than *argus*.

45. *L. argus*, L.

Not uncommon from about 3000—6000 feet from the middle of June. Staudinger refers his Kentei specimens to var. *planorum*, Alph., but I do not know how that so-called form can be distinguished, and it is evident that the variation of such a wide-ranging species as this is in all parts of Europe and Central Asia will require very

minute study before the numerous named forms can be distinguished or accepted.

46. *L. lucifera*, Stgr., S. E. Z. 1867, p. 100. Iris, v, p. 316. Pl. III, Fig. 1, 1892.

I found this beautiful species at Kuyuktana in the Tehuja Valley, at about 5000 feet, on July 21st, and it seems to be not uncommon at Ongodai in the middle of that month. My specimens agree with those collected by Leder in Mongolia. It seems to stand nearest to *eversmanni*, whilst *themis*, Gr.-Gr., of which the types from Amdo are in my collection, is a synonym.

47. *L. optilete*, Knoch.

I only found this at one spot in a willow swamp on a tributary of the Bashkans at about 5000 feet; Jacobson also took it at Ongodai. Staudinger says that his specimens from Kentei are between the typical form and the small northern one known as *cyparissus*, and he distinguishes them as var. *sibirica*. I cannot, however, see any ground for this name, as I have specimens from Kamtschatka, Irkut, and Amurland, which all appear to be very similar to those from North Russia.

48. *L. zephyrus*, Friv.

I did not take this species, but received it from Ruckbeil's collection through Herr Tancré, taken at Kenderlik, which being south of the Irtysh river is not strictly speaking in the Altai Mountains. These specimens agree with those from the Caucasus (Borjom) and from Astrabad, which are called *zephyrinus* by Christoph (*cf.* Rom. Mém. Sur Lép., vol. i, p. 102, t. vi, fig. 3, *a, b*). This was described as a var. of *zephyrus* by Staudinger (*cf.* Stett. Ent. Zeit., 1886, p. 205) from Turkestan specimens. I have seven pairs from Osch. Gultcha and Darwas taken by Grumm, which vary considerably in all the characters used by Staudinger to separate this form, and I fail to see how any of the Asiatic specimens, of which I have a long series, can be separated.

49. *L. pylaon*, Fab.

Recorded by Lederer, but not taken by any one else. The only insect I can find in Staudinger's collection from

the Altai which might have been mistaken for this, is a somewhat worn specimen of *cyane*.

50. *L. cyane*, Eversm. and var. *deserticola*, var. nov.

I found a very small form of this in the Tchuja Steppe on July 19th, when the males were much worn, flying on very bare stony ground where no other butterfly, except *Satyrus autonoe*, occurred. These are of the same size or smaller than *pylaon* from Sarepta, and on the upperside resemble that species, though on the underside they want the brown marginal spots on the fore-wing. I distinguish this as var. *deserticola*. Jacobson took at Ongodai several specimens of a much larger form, like typical *cyane* from Guberli in the Ural, but with the pale marginal border on the fore-wing less conspicuous, and the black border outside it much more so, and of a slightly darker shade of blue. I believe that this must be considered as a species distinct from *pylaon*. The females show no brown spots on the upperside of the fore-wing as in *pylaon*, and are cœrulescent in colour, as described by Staudinger in his Catalogue.

51. *L. orion*, Pall.

Taken at various places up to 3500 feet at the beginning of June, and again at the beginning of August, so that there are probably two generations, which do not seem to differ. I found the insect nowhere common, and indistinguishable from European specimens, as are those from the Alatan and Thianshan. The var. *orithyia*, Grum, from Ando (*cf.* Hor. Ent. Soc. Ross., xxv, p. 8 *sep.*), is also distinguishable, judging by the three type specimens in his collection, though the ♀ shows a little orange at the anal angle above, which none of my others do.

52. *L. baton*, Berg.

A single specimen only taken at Ongodai on June 10th.

53. *L. pheretes*, Hb.

Common from about 6000 to 8000 feet in July, and not differing, as far as I can see, from European specimens. Staudinger describes a variety from Kentei under the name of *phetimus*, as much larger, with broad black borders. A pair which I have from thence as well as one from Irkut seems to bear out this character.

54. *L. orbitulus*, Prun.

Also common at high elevations and not different from the European form, though, again, Staudinger describes those from Kentei, under the name of *orbitulinus*, as much larger. As, however, he only had one fresh specimen, I think this name is somewhat premature.

55. *L. astrarche*, Bgstr.

I only took one specimen of this in the Bashkaus at 5000 feet. This is of the normal form, but Jacobson sent five from Ongodai all belonging to the variety *allous*, Hubn., which seems to be the prevalent form in Mongolia and at Irkut.

56. *L. eros*, O.

I found this in the Tchuja and Bashkaus Valleys at about 5000 feet, but got no females. The shade of blue is, perhaps, as in those from Kenderlik collected by Ruckbeil, of a slightly greyer tinge than in Europe, but not as in the variety *erotides*, described by Staudinger, from Kentei. One of my specimens and one from Kenderlik show a slight dark mark on the centre of fore-wing above, as in the var. *stigmatifera*, Stgr. (MSS.), from Kuruk-tagh.

57. *L. icarus*, Rott.

Apparently rare, as I only took two males, one at Biisk and one in the Tchuja Valley. It is not recorded by Kindermann, or from Kentei by Staudinger.

58. *L. eumedon*, Esp.

Common in the Bashkaus and at Ongodai in July, but none of the variety *fylgia*, Spängberg, which is the prevalent form, and not an aberration in Kamtschatka, and is not uncommon in Kentei and elsewhere.

59. *L. amanda*, Schn.

Taken at Kuyuktana, at Ongodai, and in the Bashkaus, in the latter half of July. Does not differ from European specimens except, perhaps, in being smaller.

60. *L. admetus*, var. *rippertii*, Frr.

A single male of this species was taken by Jacobson at Ongodai on July 20th, and I took another in the Bashkaus. I find no previous record of its occurrence in this part of Asia.

61. *L. damon*, Schiff.

Common on the banks of the Bashkaus river on July 26th, also at Ongodai, and does not differ from European specimens.

62. *L. damone*, Eversm., var. *altaica*, var. nov.

Taken at higher elevations than the former; 5000—6000 feet in the Tchuja and Bashkaus Valleys, and common at Ongodai. This is not the true *damone*, Eversm., which I have from Guberli in the Ural and from Armenia. Both sexes have the base of the hind-wings strongly suffused with greenish. Neither of my two pairs from the Ural show this, nor do those from Ordubad, but some from Saisan in coll. Stgr. are the same as *altaica*. The species is quite distinct from *damon*, and also from its var. *juldousa*, Stgr., which has this green shade at the base of the hind-wing, but a much broader dark border on both wings than *damon*. *Actis* shows this basal colour also, but is of a quite different blue above.

63. *L. donzelii*, B.

I got a single female in the Bashkaus at 4000 feet on July 28th, and Jacobson sent me a series from Ongodai. These do not differ from European specimens.

64. *L. argiolus*, L.

I did not take this in the Altai myself, but Kindermann records it.

65. *L. sebrus*, B.

A single specimen in the Tchuja Valley on June 18th. It has not hitherto been recorded, as far as I know, so far east.

66. *L. minima*, Fuessl.

A single specimen in the Tchuja Valley on June 20th.

67. *L. lycormas*, Butl. = *scylla*, Stgr.

Two males from the foot-hills of the Altai near Altaisk, at about 2000 feet on June 7th, were all that I saw. I mistook them for *semiargus* at the time, or would have waited longer at the place. Though slightly paler in tint above they agree with *scylla* from Irkut, the Amur, and with

lycormas from Yesso in Japan. The latter is variable in the breadth of the border, and I agree with Leech in considering it identical with *scylla*.

68. *L. semiargus*, Rott.

A few specimens from the Bashkaus and Bija Valleys at the end of July.

69. *L. argali*, n. sp.

I first saw this species on June 21st, flying below rocky slopes at Kuyuktana, between the Kurai and Tchuja Steppes, where the spring was only just commencing, and some of the males were already worn. I afterwards found it commoner at about 6000 feet in the beginning of July in the mountains south of Kuch Agatch. The only European species with which I can compare it is *melanops*, but the colour of the upperside, which is a pale silvery grey, is quite distinct, and its nearest allies appear to be *lygdamas*, Dbldy., and *couperii*, Grote, which are probably identical, and are found in South Labrador, Anticosti Island, Wisconsin, and as far north as the Great Slave Lake. There is nothing like it in the Grand Duke Nicolas' collection or in that of Grum-Grshimailo, and neither Alphéraky nor Staudinger have seen anything like it. This species has a remarkable tendency to grease, which I have observed in no other *Lycæna* but *sonoriensis*, Feld. = *regia*, Bdv. from South California, and which may arise from some peculiar food plant of the larva.

♂ Upperside pale metallic silvery blue, both wings with a black marginal band, which is about as broad as that of *melanops*; underside grey, both wings with a white anteciliary line, succeeded by a dark one, a white-edged black line at the end of cell in both wings, and a dark marginal band, broken into spots, base of the hind-wing dusky with scattered grey scales. Fore-wing below with a curved series of five subequal roundish white-edged black spots placed one in each of cells 2-6, and gradually receding from the margin as they approach the costa. Hind-wing below with a nearly regular postmedian series of small subequal roundish white-edged black spots placed one in each of cells 2-7, and running parallel to the margin and a similar spot near the basal third of cell 7; the latter and the spot proper to cell 6 are sometimes obsolete or wanting, and the postmedian series is sometimes extended towards the dorsum by one or more additional spots. Fringes white, the basal half brown.

Antennæ; shaft black ringed with white, club black on the upperside, white at tip.

Expanse 21-26 mm.

Described from 18 males. I did not obtain the female.

L. melanops, its nearest European ally, has the upper-side purplish-blue, the spots in cells 2 and 6 on the hind-wing below placed at the basal third of those cells, and the fringes white with a dark median line.

In the tint of the upper side *L. argali* resembles more nearly the North American *L. couperii*, Grote, and *L. lygdamas*, Dbldy., but both these species have one or more spots in cell 1a on the fore-wing below, the spot in cell 6 on the hind-wing below standing at the basal third of that cell, and the basal half of the fringes whitish.

70. *L. arion*, var. *cyanecula*, Ev.

I found this only in the Lower Bashkaus Valley at the south of Lake Teletskoi, where it was fresh at the end of July. Berezowsky also found it at Ongodai. The specimens are very variable in size, but may be distinguished like those I have from Irkut, from Turkestan, and from Amdo by the much greater average extension, and brightness of the blue at base of hind-wings below. This is found to some extent in *arion*, especially from southern localities, such as the Pyrenees and Armenia, but never (in my specimens) extends to the margin. The var. *caucasica* seems too inconstant to bear a varietal name, but in the var. *uralensis*, Gr.-Gr., of which six pairs are now in my collection, both sexes are much darker and more uniform in colour than in Western Europe, and have the underside as in *arion* and not as in *cyanecula*.

(*L. arcas*, Rott.)

Recorded by Kindermann but not seen by me.

71. *L. euphemus*, Hb.

A few specimens in the Bija Valley at the beginning of August. Ruckbeil also got it at Kenderlik. The specimens do not differ from European ones.

72. *L. rhymnus*, Ev.

This is recorded by Lederer as taken by Kindermann.

73. *Apatura ilia*, var. *metis*, Frr.

There is a specimen in Dr. Staudinger's collection from the Altai taken by Novoprachin at or near Semipalatinsk, which is quite the same as the form found at Sarepta.

(? *Limenitis populi*, L.)

I saw, but did not succeed in taking, in the thickly wooded country north of Teletskoi, a specimen which I am almost sure was this species. It has been taken in the Kentei Mountains.

74. *Limenitis hellmanni*, Led.

Discovered by Kindermann in the South-west Altai, and since taken by other Russian collectors from Semipalatinsk, but not seen in that part of the Altai which I visited.

75. *Limenitis sydyi*, Led.

The same remarks apply to this species as to the last.

76. *Neptis lucilla*, Fab.

One of the commonest butterflies in the Bashkaus, Bija, and Tchuja Valleys, from the middle of June to the end of July, ascending to nearly 6000 feet. It flies slowly in bushy places, and is most abundant on river banks and near water. Most of the specimens are of the narrow-banded variety, *ludmilla*, which is prevalent in most parts of Asia, but intermediate forms occur.

77. *N. aceris*, Lep.

This was taken by Ruckbeil in the South Altai, and by Jacobson in the Yenesei Valley, and I have a specimen from Semipalatinsk in Grum-Grshimailo's collection.

78. *Araschnia levana*, L.

The first brood was fresh out at Ongodai on June 13th, the second in the Bija Valley on August 4th. They do not differ from European specimens.

79. *Vanessa antiopa*, L.

I took one or two of this species in the low country in August.

80. *V. atalanta*, L.

I did not see this, but it is recorded by Kindermann and Ruckbeil.

81. *V. polychloros*, L.

A hibernated specimen was seen at Obb on May 27th, and a female fresh out was taken in the Bija Valley on August 6th.

82. *V. xanthomelas*, Esp.

Herr Tancre informs me that this was taken by Ruckbeil, but I have not seen a specimen.

83. *V. urticæ*, L.

Seen here and there in different parts of the country, but commonest in the high mountains, where it was the only *Vanessa* I noticed, and came out about the middle of July.

84. *V. cardui*, L.

Seems to be scarce in the Altai. I only took one on the Bashkaus at the end of July.

85. *V. io*, L.

I took one or two in the low country in August.

86. *V. L-album*, Esp.

This was common at the north end of Lake Teletskoi and down the Bija Valley in the middle of August. When disturbed it settles on the trunks of trees, and is rather wild and difficult to catch.

87. *Grapta c-album*, L.

Hybernated specimens were seen at Barnaoul and Ongodai, and fresh ones came out in the Bija Valley at the end of July. There are two specimens in Dr. Staudinger's collection, one marked West. Sib. and one Altai (coll. Lederer), which seem to be intermediate between what is known as *interposita*, Stgr., from Margilan and Samarkan, which they resemble on the upper-side, and *egea*, which they resemble on the underside.

88. *Melitæa iduna*, Dalm.

Though this agrees nearly with typical *iduna* from the mountains of Lapland, the only locality from which I have hitherto seen it, yet, on the whole, Altai specimens may be distinguished by the more silvery, less yellowish tinge of the ground colour of both wings, particularly on the underside. I have only one specimen from Lapland which in this respect might be confused with the Altai ones. I found it common in the high mountains south of the Tehuja Steppe only, from 6000—8000 feet during the first half of July, on dry grassy slopes, associated with *aurinia* and *cinxia*.

89. *M. maturna*, L.

var. *ichnea*, Bdv. Ic., Pl. XXIII, figs. 5, 6.

var. *uralensis*, Stgr., and ab. *mongolica*, Stgr. Cf. Stgr., Iris, V, p. 321.

I found only two or three worn-out females of *maturna* at Kuyuktana on the 22nd July, but received several males from Jacobson and Berezowsky taken at Ongodai at the end of June. I have several specimens from Grum-Grshimailo's collection taken in the Altai, and two females taken by him in the Ural. I also have a pair named *ichnea* by Alphéraky from Irkut. I do not think that either *ichnea*, *uralensis* or *mongolica* are sufficiently distinct to be recognised with certainty. Some of them, like those from the Alatan Mountains, are, as Boisduval says, more or less intermediate between *cynthia* and *maturna*. Most of those taken at Ongodai are, however, much more like the form known as *wolfensbergi*, which occurs in Switzerland. It seems that both in Switzerland and in the Altai we have two mountain forms perfectly distinct from each other, that is to say, *cynthia* and *wolfensbergi* in the Alps, and *iduna* and *uralensis* or *mongolica* in the Altai. *Ichnea* being the older name, should probably be used instead of either *uralensis* or *mongolica* for the Siberian form, if it is distinguishable; but I have no doubt that a sufficiently large series from various points would show that it is not so. Boisduval says, that his *ichnea* is found in Lapland and Siberia, and his Plate is most like those from the Sayansk Mountains, the only ones which show black spots in the outer fulvous band on the hind-wing as described in

mongolica by Staudinger. What stood in Grum-Grshimailo's collection as *ichnea* from Sutschan, on the Manchurian coast, is as large as typical *maturna*, and but little different from it.

90. *M. aurinia*, Rott.

I found one variety of this, which is indistinguishable from small European specimens, at Ongodai in the middle of June, and another which most resembles *merope* in the high Tchuja Mountains the first week in July. I am doubtful, however, whether the two forms keep distinct, as one specimen taken in the dry Katuna Valley is of the *merope* type; underneath, however, they have the markings more distinct and not so confluent as in *merope*; but when a large drawer full of the numerous forms of *aurinia* from various parts of Europe and Asia are brought together, it seems to me almost impossible to define many of the numerous local varieties which have received names. The form named *sibirica*, Stgr., which I have from Kentei and Mongolia taken by Leder is, however, very much paler than any of mine, as are those named var. *mandschurica*, Stgr., from Sutschan taken by Dorries.

91. *M. cinxia*, L.

Common in the Tchuja Valley, and as high up as 7000 feet in the mountains, where the specimens are very small and dark.

92. *M. arduinna*, Esp.

This is recorded by Lederer, and I have a specimen from Grum-Grshimailo's collection from the Altai.

(*M. trivia*, Schiff.)

Recorded by Lederer but not seen by me.

93. *M. phæbe*, Kn.

I found this rare in the Altai. The specimens do not differ sufficiently from European ones to require a varietal name, though in East Asia the species becomes much larger. Its local variations, however, are often very inconstant.

94. *M. didyma*, O., var.

This was abundant in the Katuna, Tchuja and Bashkaus Valleys, and also at Ongodai. The general average of my

specimens are very like those from the Amur and Kentei which Staudinger calls var. *didymoides*, Ev., and ab. *latoni-gena*, Ev., but none of the males are so pale and devoid of marking on the hind-wings as those from Kentei, and many of them can be matched almost exactly in Europe. The females are, however, more variable, some being like those of var. *ala*, Stgr., from the Thianshan, some very pale like those from Kentei, and others with a good deal of green, as are found not unfrequently in Europe. The difficulty of defining the local varieties of this species is, however, even greater than in the case of *aurinia*.

95. *M. dictynna*, Esp., var.

I found this species not common in the Tchuja and Bashkaus Valleys in June and July. This supposed variety has been named *erycina* by Lederer, who says that a variety with a pale yellowish-white spotting on the upperside was sent by Kindermann as *erycina*, and is figured by Herrich-Schäffer (Fig. 601). I cannot see, however, that there is any reason to distinguish either the Altai form, or those from Irkut collected by Leder; I have quite similar specimens from Europe, though the Altai examples have more pale spots at the base on the hind-wings above than is usual in Europe.

96. *M. arcesia*, Brem., var. *minor*, Stgr. MSS. ?

This is a small mountain species which matches nothing exactly in Grun-Grshimailo's collection, though it comes, perhaps, nearest to what he calls *asteroidea*, Stgr., from the Alexander Mountains. It is not *solona*, Alph., as I at first supposed, being more heavily marked above, and seems to come nearest to what is now considered to be the true *arcesia*, Brem., which I have so identified by Alphéraky from Irkut. I found it only in the high mountains from 6500—8000 feet, where it was common on grassy slopes during the whole month of July in company with *cinxia*, *iduna* and *aurinia*.

97. *M. aurelia*, Nick., var. *britomartis*, Assm. (?) and var. *nova* (?).

I found in the Tchuja Valley, on June 20th, at about 4000 feet, the first specimens of this, and received others somewhat similar from Ongodai. I did not get the females until I returned to the Bashkaus Valley at the

end of July, when the species was nearly over. In the high Tchuja Mountains at 7000—8000 feet, I found a small paler form, which is not exactly like anything in my collection, though it perhaps comes nearest to the form which Ménétries called *orientalis*, of which I have several specimens from Kamtschatka taken by Herz. This is certainly distinguishable in the Altai from the valley form, which comes nearest to what is called *britomartis* in Europe, and has been so named by Grum and Tancre, from both of whom I received Altai specimens. The difficulty, however, of referring the Asiatic *Melitæas* of this group to either of the three European supposed species which they most resemble is almost insuperable, and the greater the number of specimens that one receives from different localities the greater the difficulty becomes. I have about two hundred selected specimens of the various named forms of *athalia*, *aurelia*, and *parthenie* from Europe; and from Asia I have about seventy which have been named as follows: *britomartis* from the Altai valleys; a small mountain form which I call *orientalis*, Mén., from the high Altai mountains and Kamtschatka, and one sent by Tancre as *britomartis* which resembles these; a form from N.-E. Siberia in Grum's collection named var. *sibirica*, which appears to be a MS. name; a larger and much redder form from the Alatau Mountains taken by Haberhauer, and from Kenderlik in the South Altai taken by Ruckbeil, which Staudinger calls *parthenie*, var. *alata-nica*; a form from the mountains near Samarcand named *parthenie*, var. *sultanensis*, by Staudinger, which is paler in colour above, and has the markings more obsolete below, which give it a very distinct appearance from any of the others; a small dark form, nearest to *britomartis* but differing somewhat from it below, from the Amur, which is the *plotina* of Bremer, and is considered a good species by Graeser* (Berl. Ent. Zeits, 1888, p. 88); a form named *mongolica* by Staudinger from Sutschan, larger than *plotina*, and most like *aurelia* from Germany; a form taken by Jankowsky in Manchuria, given to me as var. *magna* by M. Alphéraky: this is most like specimens from Corea,† which I treated in P. Z. S.

* One from Semipalatinsk in Staudinger's Coll. stands under this name.

† This is in Dr. Staudinger's Coll. as var. *koreana* from near Gensan.

1881, p. 899, as probably a variety of *athalia*, but which is much more like a large dark *britomartis*, and quite unlike the Japanese and Corean form of *athalia* known as *niphona*, Butl.

After writing the above I submitted a number of these specimens to Baron von Hormuzaki, who has lately studied the European forms of this group of *Melitæa* in the Verh. Zool. Bot. Gesch. Wien, and in Iris, xi, pp. 1—13. He identifies them as follows: "The form named var. *sultanensis* is certainly much more nearly allied to *minerva*, Stgr., and ought to be placed as a good species near *phæbe*, on account of the black spots at the base of the hind-wing below which are never found in the *athalia-parthenic* group.³ I may say that I have from Grum-Grshimailo's collection one of Staudinger's types of *sultanensis*; they resemble more closely what I have from the same collection as *asteroides*, Stgr., from the Alexander Mountains, than those I have received from Staudinger as *minerva* from the mountains near Osch in Fergana.

Of my specimens from the Altai he writes as follows:—"They may be considered as *aurelia*, var. *veronica*, Dorf., from which they only differ by their small size; they have all the characters of *veronica*, namely, white spots on the underside of the hind-wings, anal spot bordered with black, black bands very wide, brown marginal bands, etc.," but these characters are not constant in my series. Of the form from the high Tchuja Mountains he says, "also a variety of *aurelia* analogous by the colours to *aurinia*, var. *merope*, it deserves a name if there are many similar specimens." I may say, that I have six males and one female absolutely similar, which I can distinguish from all those taken in the valleys.

Of the specimens from Corea which M. Alphéraky calls var. *magna*, he says, "I think this is the form described as *latifuscia* by Fixsen, but whether it belongs to *parthenic* or *aurelia* is not yet sure, but a form very like it but smaller has been described by Staudinger as *mongolica*." I have a pair of this *mongolica*, and certainly would not like to separate it from the Corean form, so that if we adopt Fixsen's name, *mongolica*, Stgr., and *magna*, Alph., will have to be treated as synonyms. The form from Kamtschatka is certainly *parthenic*, var. *orientalis*, Mén., and some of my Altai specimens are hardly distinguishable from these.

98. *Argynnis aphirape*, Hb.

This was common in all parts of the country from about 5000—8000 feet the first week in July, flying in wet grassy places above the forest. The specimens are like *ossianus* in size, but paler than either that or the typical *aphirape* in both sexes, and agree with those sent from Irkut by Leder, but they are not so pale as those sent from Nicolaievsk by Graeser. On the whole, I do not see how any local forms of this species can be distinguished, as there is much variation among specimens from Finland, North Russia, and Scandinavia, which, though usually referred to var. *ossianus*, have no common distinctive character.

99. *A. selene*, Schiff.

Of this I only found a single specimen in the Upper Tchuja Valley on July 23rd. I received another taken at Ongodai by Jacobson. These might be called var. *hela*, Stgr., if there was any constancy in that form, which so far as my specimens show is not the case.

100. *A. selenis*, Evers.

I took this first at Kazan on the Volga on May 21st with the earliest spring butterflies. These specimens were pale in colour, and are typical *selenis*. In the Altai I found it at many places, from 3000 feet on June 17th, up to 7000 feet on July 23rd, when the species was still fresh in the Upper Tchuja Valley. It frequents bushes near marshy meadows, but was never plentiful, and I only got two or three females. The Altai form is more like those from Amurland and Dahuria which have been separated by Erschoff as var. *sibirica*. I have a specimen so named from his collection, but I do not see how they can be distinguished with certainty, as there is considerable variation among them, though they are on the whole darker and larger than those from the Volga.

101. *A. oscarus*, Ev.

Though I looked out carefully for this I did not succeed in finding it myself, but Jacobson took two or three at Ongodai, which seems to be its most westerly known range. The species, though very closely allied to *selenis*, *euphrosyne*, and *selene*, may, I think, be certainly distinguished by the

underside of the hind-wing. Altai specimens are much smaller than those from the Lower Amur, and not so dark as those from Irkut.

102. *A. euphrosyne*, L.

I only took this in the Tehuja Valley at 3000—4000 feet in the middle of June, when it was not common, but Jacobson and Berezowsky sent a few from Ongodai, which do not differ from Central European specimens.

103. *A. freija*, Thnb., var. *pallida*, var. nov.

This was perhaps the commonest butterfly on the dry grassy downs in the mountains south of Kuch Agatch, especially at 7000—8000 feet in places where there was little vegetation but dry wiry grass, quite unlike the boggy places which it frequents in Europe and North America. I first saw it on June 25th, and took a large series in good condition. The whole of these are at once to be distinguished from any of my large series from Europe, East Asia, and America by the pale colour of the fore- and hind-wings, which gives them the appearance of faded butterflies even when they are fresh out. This is especially noticeable on the underside of the fore-wing, and as those taken by Herz on the Vilui river are darker on the average than European specimens, I think this must be regarded as a constant local variety. The only other localities in Siberia from which I have it are Albasin on the Upper Amur river, and the E. Sayansk Mountains. Both these show some approximation to the var. *pallida*, but are distinguishable from it.

104. *A. pales*, Schiff.

This was very abundant after the middle of July from 6000—7000 feet, and varied extremely in size and colour. It was most abundant in marshy meadows above timber-line. In size they average considerably larger than European specimens, and are considered by Staudinger to belong to the form known as *Isis*, Hubn., which is in the Alps of Europe inconstant; the females vary as in Europe from the very darkest *napæa* to the palest form. I saw nothing like the Pamir and Ladak form known as *generator*, Stgr. Those taken by Leder in the Sayansk Mountains and Mongolia are, on the whole, very like my specimens.

105. *A. var. vel. bon. sp. arsilache*, Esp.

The only places where I took what I believe to be the Siberian representative of this form were by the side of a river, in a flat marshy meadow surrounded by willows at 6000 feet, and in flat swampy forest in the Bashkaus country at 4000—5000 feet. I paid particular attention to the localities, as it has been remarked, both in Lapland by Staudinger, and by myself and others in the Alps, that *arsilache* is confined to boggy ground, and does not fly like *pales* on grassy mountain sides. The difference in size, pattern, and colour of these specimens from *pales* is just about the same as in Europe, they are smaller with narrower and more pointed wings. I found no real peat-bog in the Altai, but it seemed to me that this form had confined itself as nearly as possible to flat and marshy ground, and was never on the hill-sides. Herz records *arsilache* from the Vitim river, but three female specimens taken by Czekanowsky in North-Eastern Siberia are distinct in appearance and like nothing else I have seen. My numerous specimens from Lapland, Norway, and Finland vary as much as they do in the Alps, and I am unable to say whether many of them are *pales* or *arsilache*. It is highly desirable that these two supposed species should be bred under similar conditions, which would be easy enough to any one resident in Switzerland.

106. *A. dia*, L., and var. *alpina*, var. nov.

This was fresh out at Kazan on May 21st, and at Biisk on June 4th. I did not see it in the mountains until I got to Darkoti, where it was abundant during the second week in July. All those taken here, though for the most part worn when I got them, are much darker and smaller than any other specimens of *dia* I have seen, and can be separated at a glance, both from the first brood of the low country, and from those of the second generation, which I found fresh out when I left the mountains in the first week in August. I have never heard of *dia* as a high Alpine butterfly before, and believe that in Europe it is double brooded wherever it occurs. This can hardly be the case at an elevation where the summer lasts only about six weeks. A few specimens taken by Jacobson at Ongodai were somewhat paler, but evidently belong to the single-brooded form which I propose to call *alpina*. Judging from what

Herz says of those taken by him on the Vitim, which he describes as rather small, above very dark, I presume they are the same as mine; I have none from Eastern Asia, but Herz says that three specimens sent by Leder from Mongolia were very light in colour on the upperside.

107. *A. amathusia*, var. *sibirica*, Stgr.

I only took one in the Tchulishman Valley on July 28th at 5000 feet, but received three or four more from Ongodai. All of these are smaller and paler in colour than usual in Europe, but females from St. Petersburg, which appears to be its most northern range, are also small and pale. They are the same as what Staudinger describes from the Kentei Mountains in Mongolia (*cf.* *Iris*, v, p. 330) as var. *sibirica*. A series from the Ural Mountains, taken by Grum-Grshimailo, were placed under this name in his collection, but I have some from Modane and Briançon in the Western Alps which I can hardly distinguish from these latter.

108. *A. angarensis*, Ersch.

Two males, both much worn, and a fresh female, were taken by Fletcher on July 28th at about 6000 feet in the Tchulishman Valley, and like those found by Herz on the Vilui and Vitim, average smaller and somewhat darker than those from Kentei and the Amur. The species occurs as far north as the Olenek and Jana rivers in North-East Siberia, where Czekanowsky seems to have found it abundantly. His collections seem to have been principally made in the district of Verchojansk considerably north of Yakutsk, and when worked out, as I hope they will be shortly, will form a valuable addition to our knowledge of that very remote region.

109. *A. frigga*, Thb., var. *alpestris*, var. nov.

This was to me a very unexpected discovery on the high Tchuja Mountains at from 7000—8000 feet elevation, where it was common during the first half of July on wet alpine meadows high in the mountains. A bog-loving species like its congener *A. freija* in Europe and America, it finds here no real peat, and I presume in consequence of this has developed a variety constantly different from all those in my collection both in its paleness and the comparatively slight development of the dark colour at the base of the

hind-wing. The only ones which at all approach it are those from Colorado, and these are much smaller and more rufous in colour. The only other Asiatic locality from which I have *frigga* is the Vilui river, where it is large and dark.

110. *A. thore*, Hb., var. *borealis*, Stgr.

I did not find this myself, but received two very small pale-coloured specimens from Ongodai, and have another from the Yenesei Valley in Grun-Grshimailo's collection. These three are, like the Amur specimens, paler than any from Europe, though they most resemble those from Lapland known as var. *borealis*, Stgr.

111. *A. ino*, Esp.

This was abundant in the Bashkaus country and round Lake Teletskoi below 4000 feet, at the end of July, and the specimens do not differ appreciably from European ones; though those from Irkut and Kentei, which are larger and paler, have been separated as var. *clara* by Staudinger, whilst those from the Ussuri district and Lower Amur, var. *amurensis*, Stgr., are again much larger than either.

112. *A. daphne*, Schiff.

This I did not take, but received two pairs from Ongodai, which agree with European specimens.

113. *A. hecute*, Esp.

This was abundant only in one place, just north of the Kurai Steppe in a luxuriantly wooded valley, and was fairly fresh on July 23rd. Berezowsky and Jacobson took it at Ongodai. The Altai specimens are most like Hungarian ones, both sexes, the females especially, being much darker and more heavily marked than the form from the Pamir known as *aluica*, Stgr.

114. *A. lathonia*, L.

I did not see this, though Lederer records it from the Buchtarma Valley.

115. *A. aglaia*, L.

This was common from about 6000 feet down to Lake Teletskoi in the latter half of July, and did not appreciably differ from average European specimens.

116. *A. niobe*, L.

This was common in the Bashkaus Valley, and also at Ongodai in July, and did not differ from European specimens.

117. *A. adippe*, L.

Found at the same time and place as the last. Most of the specimens have the silvery spots below, but one belongs to the variety *cleodoxa*, O. All of them have the androconia on veins 2 and 3 well marked, which is not the case in some of the specimens from Mongolia, North China, Korea, and Amurland, which may belong to another species, which as yet I am not able to define exactly. Those with the androconia only on vein 2 seem to occur in Amurland, Korea, and in North and Central China and Japan, with *adippe*, *niobe* and *nerippe*, and are usually confused in collections with one or other of these.

118. *A. paphia*, L.

Common above and below Lake Teletskoi in the Bija Valley, and does not differ from European specimens.

119. *A. pandora*, Schiff.

I did not see this species, but it was taken by Ruckbeil in the South-West Altai.

120. *Melanargia iapygia*, var. *suvarorius*, Hbst.

I did not take this myself, but have received specimens from Herr Taneré taken by Ruckbeil. It is also recorded as *M. clotho* by Lederer. I have seen it from the Yenesei Valley, where Jacobson found it rarely.

121. *Erebia maurisius*, Esp., t. 113, 4, 5. Pl. XI, fig. 1, 3 ♂ 2, 4 ♀; and

122. *E. theano*, Tausch. Mem. Mosc. I, p. 207, t. 113, 1. Pl. XI, fig. 5 ♂ 6 ♀.

I got a large number of specimens of these two species, which enable me to appreciate their distinctive characters in a way which I could not do when I last wrote on the genus *Erebia*. Esper's figure of *maurisius* combines the distinctive characters of both species in a way which renders it impossible to say with certainty which he had before him, though I am inclined to think it was a var.

of *maurisius*, with the outer margin of the hind-wing below resembling that of *theano*. Such a specimen, however, does not exist in the large series which I took, but even if it were *theano*, I prefer to retain the name now generally known for the species here described and figured. First as to their habitat: *maurisius* is an alpine butterfly occurring in greatest numbers from about 7000 to 6000 feet on wet grassy and rocky hill-sides, above and within the limits of the larch woods. In the Bashkaus Valley I took it as low down as 5000 feet, and here, as well as at Kuyuktana, between Kurai and the Upper Tchuja Steppe, I found it in company with *theano*, and though some specimens are so like *theano* that when taking them I did not distinguish them, there are none which I cannot now assign with tolerable certainty to one or other species. *Maurisius* was first taken on July 15th near Darkoti in the mountains south of the Tchuja Steppe, and became very abundant about a week later, when I took the first females. At Kuyuktana on July 22nd and 23rd the males were getting somewhat worn, whilst the males of *theano* were quite fresh and the females not yet out. On the pass between Kurai and the Bashkaus it was so abundant at from 6000—7000 feet that I got twenty females in one day, and as I descended this valley it was gradually replaced by *theano*, and disappeared altogether before I descended to the Tchulishman Valley.

The range of *theano* in this district therefore appears to be from about 3000—6000 feet, and that of *maurisius* from 5000 to nearly 8000 feet. The latter varies extremely, as will be seen by the figures I give; but the characters by which it may be invariably distinguished from *theano* are as follows. On the underside the band of fulvous elongated blotches on the fore-wing below are evenly bounded on the inside by the darker chocolate of the cell, whilst in *theano* the fourth and fifth spots, which are normally longer and paler than those of *maurisius*, are longer inwardly than the third spot. In *theano* the group of spots at base of hind-wings below is far better defined and more developed, though they are sometimes nearly wanting, and in the females of *maurisius* are sometimes present, though *never to the same extent* as in *theano*. The outer margin of fore- and hind-wings below is normally grey in *theano*,* whereas in *maurisius* it is of the same

* In figure 5 the colour comes out too red.

colour, or nearly so, as the rest of the hind-wing. The fringes of *theano* are distinctly white when fresh, chequered with brown at the ends of the veins, whilst in *maurisius* they are unchequered and usually dark. In my last Revision of *Erebica* (Trans. Ent. Soc. Lond., 1898, Pt. II, pp. 175 and 188) I treated *stubbendorfi* as a form of *maurisius*, whereas by these characters there is little doubt that it is a var. of *theano*, though the marginal and basal markings of both wings below are much less developed and sometimes entirely absent. I did not see this form in that part of the Altai which I visited. *Pawlowskyi*, on the other hand, I have little doubt is an Eastern form of *maurisius*; I have specimens collected by Leder in the East Sayansk mountains which are absolutely intermediate, and some of the females cannot be distinguished from Altai specimens. This variety is more distinct in the Chamardaban Mountains south-east of Lake Baikal, and extends in a small arctic form, in which the spots of both wings above and below are much reduced in size, as far north as the Olenek river within the Arctic Circle, where it was collected by Czekanowsky. As it was described from the Yakutsk district, this small form is probably the typical one.

The species will now stand as follows :—

Maurisius, Esp. Altai, 5, 8000 feet = *kindermannii*, Stgr.

var. *borcalis et orientalis*, *pawlowskyi*, Mén. East Sayansk Mountains, Chamardaban Mountains, N.-E. Siberia.

var. *occidentalis*, *haberhaueri*, Stgr. Tarbagatai Mountains.

Theano, Tausch. Altai, 3, 6000 feet.

var. *stubbendorfi*, Mén. S.-W. Altai, (? Semipalatinsk district).

123. *E. kefersteini*, Ev. Plate XI, fig. 8, 9 ♂ 10 ♀ (fig. 7 ?).

Next to *maurisius*, this was the most abundant *Erebica* in that part of the Altai which I visited, from about 5500—7500 feet, and is extremely variable, as will be seen by the four figures in my Plate. I cannot say that either of these four figures can be considered typical, three representing rather the extreme variations in either direction, one (fig. 10) with well-developed ocelli, another

(fig. 8) with much fulvous in the fore-wing, and a third (fig. 9) in which the markings are at a minimum; fig. 7 is possibly either a hybrid between *kefersteini* and *maurisius*, in whose company it occurred, or an aberration of one or other, I cannot tell which. *Kefersteini* appears to be equally common in the East Sayansk and Chamardaban Mountains, whence it was originally described, and probably occurs right through the mountains of Central Siberia. It appears in the latter half of July, but I did not take the females till the end of the month, and they appear to fly but little, as most of those I found were settled on grass stems, or kicked up out of the long grass.

124. *E. tyndarus*, Esp.

This was an abundant species at from 6000—8000 feet in the latter half of July, on similar ground to that which it frequents in the Alps. The form found in the Altai is nearer to var. *dromus* than to *tyndarus* from the Alps, but can be distinguished from the former by the great inward extension of the fulvous on the fore-wing above, which extends half-way down the wing, and by the underside of the fore-wing having no transverse band as in *dromus*, and in the Caucasian form which is referred to *dromus*. In both these characters it resembles the American variety from Colorado more than those from Armenia or North Persia, known as var. *dromulus*, Stgr., and var. *iranica*, Gr.-Gr. They are not, however, like Staudinger's description of var. *sibirica* from Tarbagatai, being no larger on the average than Alpine specimens, and the spots on the hind-wing are sometimes very conspicuous and sometimes almost absent. I can distinguish most of them, as also those taken by Leder in the Sayansk Mountains, from any of the named varieties by the inward projection of the chocolate patch on the upperside of the fore-wing. In all other forms of *tyndarus*, except, perhaps, those from the Caucasus, the chocolate patch on the fore-wing above is rather a band fairly straight on the inner margin; in the Altai form it runs in a blunt point more than half-way towards the base of the wing. On the underside the whole centre of the fore-wing is plain chocolate, as in var. *ottomana*, without any transverse band as in *dromus*.

125. *E. æthiops*, Esp.

This was common in the forests round Lake Teletskoi

below 2000 feet, Bija Valley, and open country towards Biisk, towards the first week in August, and does not differ from European specimens.

126. *E. sedakovii*, Ev.

Common in the forest country of the Bashkaus and its tributaries the last week in July, but the females had not appeared at the time we left this country. Jacobson also found it common at Ongodai, and sent me a female taken on August 8th. The Altai specimens vary little, and seem smaller than those from the Amur country. The range appears to be from about 3000—5000 feet, never mixing with *æthiops*. It flies on grassy places in open forest.

127. *E. ligea*, L.

Abundant in larch forests in the Tchulishman Valley, where I first saw it on July 27th at about 4000 feet, when the males were a little worn and the females quite fresh; from this point down to Lake Teletskoi in the Bija Valley the species was common. The bands above are somewhat paler and broader than average European specimens, as are those from Lake Baikal and the Amur Valley, but not to the same extent as in the typical Eastern form *ajanensis*, Mén.

128. *E. curyale*, Esp.

I found this myself only on the north side of the Kurai Pass in marshy larch forest at 5000—6000 feet, on July 25th and 26th, when specimens were mostly worn. They did not occur where I found *ligea*. Jacobson and Berezowsky took it at Ongodai, and some of these specimens might as well be called *ligea*. In fact I am not able to draw a line between them, for though the same general characters by which they are separated in Europe, namely, smaller size and less distinct markings below, will usually separate them in Asia, yet there are some which cannot be certainly referred to either species. The general character, however, is like those from the Irkut Valley, referred to in my recent paper on the genus *Erebia* in Trans. Ent. Soc. 1898, p. 198.

129. *E. lappona*, Esp.

Found in the Tchuja Mountains at about 8000 feet, but not abundantly, on July 9th and 10th, and on the

Kurai Pass July 25th. The specimens do not differ from those of the Alps.

130. *E. fletcheri*, sp. nov. (Plate XII, fig. 4 ♀).

When we crossed the pass between the Kurai and the Bashkaus on July 24th, Mr. Fletcher took at about 7500 feet a single female *Erebia*, which I at once perceived to be distinct from anything I had seen in the Altai. As, however, I did not see it till the evening, I rode back the next day a distance of four hours to see if I could find more of it, but was unsuccessful. Though it comes extremely close to and is perhaps identical with a worn female taken by Leder somewhere in the Irkut Valley, which was sent to me by M. Alphéraky as a female of *E. dabanensis*, yet it differs so much from two undoubted females of that species taken in the Chamardaban Mountains a little to the eastward, that after submitting it to Dr. Staudinger for his opinion, I venture to describe it as a new species. On plate XII, fig. 4, I have figured this specimen, together with a pair of *dabanensis* (fig. 5 ♂ 6 ♀) and a female (fig. 8) taken by Herz on the Vilui river, and identified by him with *dabanensis* (cf. Iris, xi, p. 246, 1899). This latter specimen, as well as a male from the Vilui, for which I am also indebted to the Grand Duke Nicholas Michailovitch, and another female (fig. 7), taken by Czekanowsky on a tributary of the Olenek river in North-Eastern Siberia, for which I have to thank the Museum of the Imperial Academy of Sciences at St. Petersburg, differ from *dabanensis* in the bands and ocelli below on both wings, as shown in the plate. They are probably an Arctic variety of *dabanensis*, but our knowledge of the fauna of these remote districts is not yet sufficient to decide their specific position with certainty. These three probably form a group, as far as we know confined to Eastern Siberia, which has no near ally in Europe.

131. *E. rossii*, Curt.? var. *cro*, Brem. (Plate XII, fig. 1, 3 ♂ 2 ♀).

On June 27th, when approaching a flock of *Ovis ammon*, I saw a large dark butterfly flying on the shaly slope of one of the high mountains south of the Tchuja Steppe, which I at once saw was an *Erebia* new to me, and as soon as the rams were out of sight I got out my net and caught

it, and was much surprised to find, so far from the locality where it had previously been taken, this rare and peculiar species. In two or three days it became quite common, and throughout the month of July, wherever the ground was suitable, it was with *Argynnis freija*, one of the most abundant butterflies. It frequents steep shaly and rocky hillsides from about 7000—9000 feet, and is not difficult to catch on a hot day, though of all the *Erebias* I have ever taken it is the most difficult to get in perfect condition. I have figured two males and a female, of which figure 1 is the most typical. The colour of the rings round the ocelli comes out too yellow in all these figures, it is rather a chocolate colour. There is considerable variation in the ocelli, which above are normally as follows: one with a double pupil near the apex of the fore-wing, and about three on the hind-wing; sometimes, however, specimens such as figure 3 occur, and I have seen one in the St. Petersburg Museum from Kansk, in which the ocelli are even better marked than this. I have never, however, seen a male in which the fulvous shows on the upperside of the fore-wing as in figure 2. The hind-wing below is the characteristic feature of this species, the ocelli being always replaced by white dots, normally four in number, near the outer margin of the paler band. The underside of the fore-wing is, except the margin and costa, constantly fulvous, more so than in specimens from the East Sayansk Mountains, and as far as I can judge the insect, which I have compared with Bremer's type, is absolutely identical with those from Hudson's Bay referred to in my last Revision of *Erebia* (Trans. Ent. Soc. Lond., 1898, p. 202). If, as I believe, these are identical with *rossii*,* which, however, appears to be a smaller and Arctic form of the species, the Asiatic form will have to be treated as a variety of it. The fringes of all my specimens are uniformly dark, but in one or two there is a slight tendency to pale chequering, which is better marked in a female from Chamardaban, ex. coll. Grum-Grshimailo.

132. *E. edda*, Mén.

This is another of the rare species hitherto only known from Eastern Siberia. I found it first in the Tchuja

* The *genitalia* seem to be identical with those of *rossii* as figured by Aurivillius, Ins. Vega Exp., iv, t. 1, iv. Cf. Elwes, Trans. Ent. Soc., 1898, p. 202.

Valley on June 19th, a very wet day, when I caught three males fresh out at about 4000 feet. On the next day, at the foot of the pass on the road to Kurai, it was quite abundant along the dry bed of a mountain stream, where with Mr. Fletcher's help I got twenty fresh males in an hour. A single female, however, was the only one I could procure, and I never saw the insect again, though Jacobson and Berezowsky got two or three at Ongodai a little smaller, and with a little more fulvous on the fore-wing than in most of my specimens. It flew weakly in the grass, and settled only on stones in the bed of the river, and appeared to be confined to a very limited area. The species is a very distinct one, probably most nearly allied to *tristis*, from which, however, the chocolate circles surrounding the ocelli on the fore-wing and the much richer brown of both wings will constantly distinguish it. In the male only there is a distinct velvety patch in the centre of the fore-wing above. Occasionally there are one or two smaller ocelli below the large double-pupilled one. On the hind-wing below there are three distinct marginal white points, and one larger one at the edge of the somewhat indistinct central dark band. There is also a greyish patch near the costa on the hind-wing below. The fringes are in very fresh males dark, but in my only female the edge of the fringe on the fore-wing is grey. The only difference between the sexes is the paler colour of the ring on the fore-wing.

133. *E. afra*, Esp.

I did not take this, but it is recorded by Kindermann and Ruckbeil, and I have specimens from near Semipalatinsk in Grun-Grshimailo's collection.

134. *E. cyclopius*, Ev.

This fine species, which appears to be an inhabitant of pine forest in the low country rather than a mountain species, was not seen by me, but Herr Tancre' has sent me a specimen taken at Justid (?) in the Altai by Ruckbeil, which agrees perfectly with other Siberian specimens. Grun-Grshimailo seems to have found it common near Miask in the Southern Ural, and I have five beautiful fresh pairs from that locality in his collection. Some of these show a tendency to fawn-coloured markings at the end of the veins of the fore-wing. Jacobson also found it in

the Yenesei Valley, and it occurs in the Kentei Mountains and Amur Valley.

(*E. medusa*, Fab.)

This is the only species of *Erebia* which I expected to find, but did not, in the Altai. Though it has not hitherto been taken there, so far as I know, yet as Jacobson found it in the Yenesei Valley, and Leder took it in Mongolia, it will probably be found. A fine series of the variety *uralensis* taken at Miask by Grum-Grshimailo at the end of May are fairly constant in the distinguishing characters of the underside. Most of the males and all the females show a well-marked grey dusting on the hind-wing and apex of the fore-wing, which is characteristic of this variety, and an equally fine series of *medusa* from Podolia, which is the nearest point in Europe from which I have it, show a slight trace of this in one or two females only. An additional character of *uralensis*, which is also common to var. *polaris*, is the absence of the large chocolate-ringed ocelli on the hind-wing below.

135. *E. embla*, Thunb.

This I took only on June 20th, close to the place where *edda* was common, but within the forest. I found four males in all, and never saw the species again, neither was it found at Ongodai. These four males are precisely similar to those taken in Kamtschatka by Herz, and described by Alphéraky as var. *succulenta*, which, like those from Mongolia named *lama* by Staudinger, are in my opinion an oriental variety. I have, however, one or two males from Scandinavia hardly distinguishable from them. They are fairly distinct from those which Ménétries called *embla-disa*, of which I have several pairs from the Vitim and Vilui rivers taken by Herz, who says (*Iris*, xi, p. 246) that many of them approach *disa*. When I wrote last year on *Erebia* I said that I had seen no true *disa* from Siberia; there are, however, several in the Museum at St. Petersburg taken by Czekanowsky on the Upper Tunguska river, which cannot be separated from *disa*, and as I have also one from Northern Siberia, we must conclude that the two species remain distinguishable in Asia as in Northern Europe. I may add, that among Czekanowsky's Siberian collection are two or three specimens which appeared to me indistinguishable from *E. fasciata*, Butl.,

hitherto only known from arctic America, though I have not yet had an opportunity of comparing them.

136. *Erebomorpha* (gen. nov.) *parmenio*, Boeb.

I first saw this butterfly on July 2nd, flying before a strong wind. It had a very peculiar flight like nothing I had ever seen before, and after pursuing it for about a mile on horseback I finally succeeded in catching it by getting down wind of it and waiting for it. A week later it became very common in a broad gravelly flat intersected by arms of the river, and covered with a rich flora of beautiful flowering plants and grasses growing amongst the stones; and by July 15th it became one of the most abundant butterflies all over the dry parts of the country, extending up to quite 7000 feet, and was last seen in the Bashkaus Valley at about 4000 feet on July 25th, when it was worn out and nearly over. The flight of this butterfly is quite unlike that of any other *Erebia* I know, and this in conjunction with its very short antennæ, great difference of size and shape in the sexes, and other peculiarities inclines me to put it in a new genus for which I propose the name of *Erebomorpha*. In my last revision of *Erebia* I grouped it with *myops*, *maracandica*, *radians*, *kalmuka*, *hades*, and *herse*, to all of which its venation is somewhat similar. Dr. Chapman, however (*cf.* Trans. Ent. Soc. Lond., 1898, p. 233) states that *myops* is not an *Erebia* and comes nearest to *Cænonympha*; in this I am willing to agree with him. *Maracandica*, *kalmuka*, and *radians* may be grouped with it, but *hades* and *herse* seem to go better with *Paralasa*, Moore. The clasp-form of *parmenio* according to Chapman is nearest to that of *afra*, and it may be that these two species are more nearly allied than their superficial appearance would lead one to suppose, but I have never seen the last alive. *Parmenio* differs in its manner of flight from any butterfly known to me, flapping slowly along near the ground with its hind-wings in a different plane from the fore-wings; it settles on grasses, and where it is abundant rises in swarms before one's horse's feet and flaps slowly out of the way, unless the wind is strong, when it is liable to be carried off to a considerable distance. The females come out about a week after the males, and were common on July 11th; they can be recognised by their weak jerking flight and are very easy to catch.

The form of *parmenio* which I took in the high Tchuja Mountains is constantly smaller than those which I found in the Tchuja and Bashkaus Valleys, and from those taken at Ongodai by Berezowsky, only one male out of ten pairs from the high mountains could be confused with all the other specimens I have. The males of this high level variety which might be distinguished as var. *alpina*, average about 45 mm.; the largest (one male) is 51 mm. The females measure about 40 mm. The smallest of the males from Ongodai is 51 mm., and the average about 53 or 54 mm. This alpine form is also much darker with less rufous in the fore-wing and the ocelli smaller; on the underside I see no difference. The Altai Mountains appear to be the most westerly locality in which *parmenio* has been taken. It is common in the Irkut Valley; Dorries found it in high-lying forests in the Kentei Mountains in Mongolia, and Graeser took it abundantly at Pokrofska on the Upper Amur.

Among all the insects I collected in the Altai none have given me anything like so much difficulty to identify as the species of *Encis*, and though I have compared them very carefully with what I believe to be now an unequalled series of all the known species, I am still doubtful what to call some of them. Though I revised the genus so recently as 1893,* and endeavoured to use the form of the clasp as a guide to the separation of the allied species the acquisition of much new material obliges me, as I find it usually does, to modify several of the opinions then formed, and as I am practically obliged to revise the Asiatic species again in order to identify the Altai ones, I may as well give the results here.

137. *Encis mulla*, Stgr., Stett. Ent. Zeit., 1881, p. 270, vel. sp. nov. (Pl. XIII, fig. 1 ♂, 7 ♀).

I found this rare and little-known species at one spot only, about thirty miles south of Kuch Agatch, on stony ground among rocks, and confined to a very narrow area.

As we rode up the valley on June 25th, and had just come in sight of the first flock of *Ovis ammon*, I saw a specimen settled on a rock and caught four males in about five minutes.

On June 28th I returned to the place, and after

* Trans. Ent. Soc., 1893, pp. 457—481.

waiting some time took one ♀ only, the sun being very fitful, and the insects wild and difficult to approach; two more visits to the place only resulted in the capture of four more females, three of which, however, were quite fresh. In its habits this is a true *Encis*, but in appearance the female is very like *Satyrus hippolyte*. It is not so nearly allied to *jutta*, as I thought when I revised the genus. The male has a distinct sex-mark which, notwithstanding what Dr. Staudinger says (*Iris*, vii, p. 248, *note*), is, though not absolutely constant in some species, a very useful character in separating these nearly allied insects. P.S.—Since seeing Dr. Staudinger's types I am not at all certain whether this is the same species as *Mulla*, which as Staudinger says is a near ally of *jutta*, and resembles that species more on the underside than mine does. As, however, there are only two males in his collection, and I am unable to examine the *genitalia* of the type, I will not give another name until more material comes to hand.

138. *Æ. norina*, var. *altaica*, var. nov. (Pl. XIII, fig. 2 ♂, 5 ♀).

This fine species was first taken in the Tchuja Valley at about 4000 feet on June 19th, and the female a few days later near Kurai. I did not see more than one or two specimens on any occasion, and as it flies fast in open larch woods and settles on tree-trunks it was hard to catch. When we returned to the valley again a month later I got three or four more, mostly worn specimens. I have also a female from Grum's collection from the south-western part of the Altai (near Semipalatinsk), and have seen others taken at Kysas in the Abakan district of the Yenesei Valley in 1897 by Jacobson, which I believe to be the same species. I also have four males taken by Ruckbeil in 1881 or 1882 in the South-Western Altai sent to me by Herr Tancre as *norina* var.; but the females from Tchingistai sent me this year by him as *norina* var. appear to be *verdanda*, Stgr. (Plate XIV, fig. 6 ♀). The males when quite fresh are very dark, a much more chocolate colour than the females, or than any *norina* from Scandinavia. The underside of the hind-wing is also much more brightly marked and spotted than in *norina*. But the character of the sex-mark, the form of the band of the hind-wing, and that of the clasp which appears identical with that of *norina*, incline me to think

it is only a variety of that extremely variable species, and the difference between it and typical *norna* are not so great as between large Swedish specimens and the very small, pale, and sometimes almost unspotted specimens which are found on the Porsanger Fiord in Arctic Norway, and are known as *ab. fulla*, though I think they are distinct from the true *fulla* of Eversmann, of which I have seen the types at St. Petersburg, and which occur in the Alatan and Tarbagatai Mountains.

139. *Æ. dubia*, n. sp.? (Pl. XIII, fig. 6 ♂; Pl. XIV, fig. 3 ♀).

Though I have considerable doubt as to whether this is a good species, or only a form of the last, yet I have no difficulty in separating it from any specimens of *Æncis norna* in my collection by the following characters, which are found in 9 ♂ and 2 ♀ in my collection.

First, there is a total absence of the androconia which forms a conspicuous sex-mark on the fore-wing in all specimens of *norna* from Europe or Asia.

Secondly, a difference in the form of the clasp, which does not agree either with that of the *jutta*, *norna*, *nanna* or *bore*, with all of which I have tried hard to identify it.

Thirdly, the much darker colour of the female.

Fourthly, the fact that it seems to appear much later in the season than *norna*, var. *altaica*.

The only one I took myself was a fresh ♀ on July 24th (Pl. XIV, fig. 3) in swampy larch forest north of the Kurai Pass; this was quite fresh five weeks after *norna* first appeared. I received, however, from Messrs. Berezowsky and Jacobson ten males and one female taken at Ongodai in July, which are evidently the same species, and no *norna* was amongst them. I cannot see any well-marked difference from *norna* in the colour or pattern of the males, though the transverse band of the fore-wing below is very faint or obsolete in *dubia*, and well-marked in *norna*, var. *altaica*; and the difference in colour of the fulvous outer band on both wings above is striking. I have also compared specimens with Dr. Staudinger's collection, and can find nothing like *dubia*, but I believe that in the collection made by Jacobson in the Yenesei Valley in 1897, now in St. Petersburg, there is one of this species, as there is also one of my *norna*, var. *altaica*.

140. *Æ. nanna*, Mén. (Pl. XIII, fig. 3 ♂ 8 ♀; fig. 4 ♂ ab.?). *Æ. hulda*, Stgr., Rom. Mém., vol. iii, p. 149, t. xvi, 8 ♀; *Æ. nanna*, Mén. *op. cit.* vol. vi, p. 200.

I found this very rare at about 6000 feet in a rocky larch wood above Kuyuktana in the Tchuja Valley on July 22nd, when I took a fresh male and a somewhat worn female. At the time I took them to be a var. of *norna*. On comparing them carefully with typical specimens of *nanna* from Pochrofka on the Upper Amur, with Ménétries' figure of ♂ *nanna*, and with Staudinger's figure of ♀ *hulda*, afterwards identified by him with *nanna*, I think mine are the same. The sex-mark in this species is sometimes very well marked, in others as Staudinger truly says,* "Nur sehr schwach bei einigen Stücken fast gar nicht erkennen," but the number of the ocelli (in all my specimens five on the hind-wing), the form of the band on the underside which does not form such a sharp point inwards as in *norna*, and the much more mottled and less distinct band below than in *urda* (though fig. 3 in this respect is aberrant), seem to me to make the species distinguishable from any other. I have a single specimen, however (fig. 4), which I took at about 6000 feet near Darkoti, in the same locality where *sculda* was common, and which I doubtfully assign to *nanna* by its sex-mark and the form of its clasp, in both of which it differs from *sculda*; but for the clasp, I should rather have supposed this specimen to be an alpine form of *norna*. Though I saw no *norna* in this district above the limit of forest there was a clump of stunted larch in the neighbourhood where *norna* might occur. Since writing the above I have seen Dr. Staudinger's types of *hulda* = *nanna*, and am convinced that it is a good species, and that mine are the same.

141. *Æ. sculda*, Ev. (Pl. XIV, fig. 5 ♂ 9 ♀; Plate XIII, fig. 9? ab. ♂).

This species and var. *pumila*, Stgr., which has not previously been recorded from the Altai, but only from the neighbourhood of Kiachta in East Mongolia, and from Pochrofka on the Upper Amur, was first taken near Ongodai on June 10th and was not uncommon on grassy hill-sides in the Ongodai Valley; though strange to say it was not included in Mr. Jacobson's collection. In the first half of

* Iris, vii, p. 248.

July I found it extremely abundant from 7000 to 8000 feet on the high grassy hill-sides in the wild sheep country, where it was by far the commonest *Oeneis*, and perhaps, except *Argynnis freija*, the commonest butterfly. It was extremely variable in the number of ocelli, some specimens having as many as four on the hind-wing, and some none at all. The colour of these alpine specimens was also normally much paler and more fulvous than those from the wooded Ongodai Valley, which are a darker brown or dull chocolate tinge as in fig. 5, like those from Amurland. This species always rests on grass and avoids rocks, and is very easy to take as its flight is short and weak as compared with other *Oeneis*. The wings seem to be of an extremely tender character, becoming worn very soon after it emerges from the chrysalis.

142. *O. bore*, var. *ammon*, var. nov. (Pl. XIV, fig. 2 ♂ 7 ♀).

Found fairly common in the higher parts of the country I visited from 7000 to nearly 9000 feet after July 2nd. The females, however, were comparatively scarce, and the insect hard to catch, as it frequents swampy ground and flies fast.

It is distinguished from the nearly allied *hora*, of which *verdanda*, Stgr., seems to me a slight variety; and also differs from *fulla*, Ev., by its much darker colour. It agrees with *fulla* in having a more or less conspicuous sex-mark, which *hora* has not, and differs from both in the clasp and in the band of the hind-wing below, which is as broad or broader at the costa as it is lower down, and resembles that of var. *taygete*. The veins of the hind-wings below are not so whitish as in that variety, but it comes nearer to it than to any Asiatic species I know, and has a similar clasp; only one ♀ among the thirty or forty specimens I took had ocelli or spots on either surface, whereas in *hora* and *fulla* there are usually (not always) one or two on the fore-wing, and one on the hind-wing.

The above six species were all I took myself, but as several others have been taken, or may be expected to occur in the Altai range, I will here allude to them.

143. *O. tarpeia*, Pall.

Not taken by me, but recorded by Lederer and Tancré. I have specimens from the neighbourhood of Semipalatinsk in Grun's collection.

Eneis hora, Gr.-Gr., Hor. Ent. Ross., xxii, p. 307; Rom. Mém., iv, t. xx, 1, and var. ? *verdanda*, Stgr., Iris, x, p. 349. (Pl. XIV, fig. 1 ♂ 6 ♀.)

This is a very little known insect, which was originally described from two males taken by Grum-Grshimailo in the Altai Pamir; these types are now in my possession. It is a near ally of *bore*, which it represents in the high mountain ranges of Central Asia. A form of it described by Staudinger in Iris (vol. x, p. 349) as *verdanda*, is common in the Thianshan, the Borochoro Mountains (part of the same range), and in the Kuruk-tagh Mountains near Korla in Eastern Turkestan. I also received from Herr Tancre three males and two females (the latter marked '*norna* var.' Pl. XIV, fig. ♀) from Tchingistai in the South-Western Altai, which I cannot distinguish from *hora*.

The principal, if not the only difference, which I am able to see between the types of *hora* from the Pamir, and the twenty-one other specimens in my collection (three of which are from Korla) is that in the latter the band of the hind-wing below ends at the costa in a more or less narrowed and pointed apex, instead of coming right up to the costa in a broad band. Otherwise the two forms are practically identical, and differ from the Asiatic form of *bore* which I have above described in having no male mark. The clasps of *hora* and *verdanda* seem identical and want the large tooth near the middle of the upper edge found in clasps of the *bore* type. The ocelli, which are not very conspicuous, vary as in other species, two being the normal number on the fore-wing and one on the hind-wing. In colour they are brown, often more fulvous than the Altai *bore* which is blackish, whilst *fulla* is grey. And the females, especially those from Tchingistai, are paler fulvous than the males, whereas in *bore* and *fulla* the two sexes are nearly or quite the same colour. The ♂ figured is from Tchingistai (ex. Tancre), and differs from the types of *hora* from the Altai now in my collection in having no *ocellus* on hind-wing above, and being rather less fulvous in colour. I figure it to show that the character principally relied on by Staudinger when describing *verdanda*—namely the shape of the band on the hind-wing below—is inconstant, and am quite ready to admit that neither *hora* nor *verdanda* are specifically distinct from *bore*.

Æ. jutta is not yet recorded from the Altai, but as it was taken in the Upper Yenesei Valley by M. Jacobson, I quite expect it to be found.

Æ. urda (Ev.) may also occur in the Altai district, as I have a pair in Grun's collection from the Oka river, which is west of Irkutsk.

Æ. bore, var. *panza*, Christoph. = *semidea* var. *panza*, Christ., Iris, vi, p. 87; *crambis*, var. *panza*, Herz, Iris, xi, p. 247 (1893). (Pl. XIV, fig. 4 ♂.)

This species was sent to me by Alphéraky as *crambis*, var. *panza*, but after studying what Dr. Staudinger has said about it in Iris, viii, p. 250, I agree with him that it should be treated rather as a variety of *bore*, and Mr. Edwards' examination of the clasp-form confirms this opinion, though Herz in his account of his Lena expedition (Iris, xi, p. 247) apparently overlooking what Staudinger has said, treats it as a variety of *crambis*. I have five males and two females taken by Herz which show an indistinct sex-mark in the male, and I have two females from the Tomba river in the district of Verchojansk taken by Czekanowsky. The bands of these vary somewhat below, and the two latter specimens do not show the pale marginal bands above as in the Lena specimens, but I think that they can belong to no other species, though not unlike a ♀ of what I believe to be *jutta* from the same locality.

Æ. tunga, Stgr., Iris, vii, p. 248, t. 9, fig. 1 ♀; *Æneis semidea*, var. *also* (Bdv.) Ic, p. 197, t. 40, figs. 1, 2; apud. Herz, Iris, xi, p. 247. (Pl. XIV, fig. 8 ♀.)

I have seen specimens of this species in the collection of the Grand Duke Nicholas Michailovitch, and have to thank him for a male from the Vitim river, the clasp of which agrees with that of *semidea*; and a female from Irkut which I have figured, and which I think without doubt is the same species as *tunga*, Stgr. A third specimen, also a female, from Chamaradaban in Grun-Grshimailo's collection agrees very well with these, which M. Alphéraky and Herz identify with *also*; and though Boisduval says he received *also* from Siberia through Eschscholtz, his figure does not represent *tunga*, but is more probably taken from an American specimen of *semidea* which he supposed to be the same as *also*. *Semidea* or some-

thing like it may probably be found in North-East Siberia, but as *tunga* is in the type specimens, and in all the others I have seen unmistakably different, I think the name of *also* must remain as heretofore a synonym of *semideca*. The types of *tunga* were taken by Leder in the East Sayansk Mountains, and the species may probably occur also in the high mountains of the Altai.

144. *Satyrus semele*, L.

This was taken at Saisan in the Irtysch Valley by Ruckbeil, but not seen by me.

145. *Satyrus heydenreichi*, Led.

Taken by Kindermann and Ruckbeil, but not seen by me.

146. *S. hippolyte*, Esp.

A small pale-coloured variety of this, showing much less of the yellowish colour on the band of the fore-wing and hind-wings than in any of those I have from the Thianshan, Orenburg, and other parts of Western Siberia, was very abundant on the bare Tchuja Steppe (6000 feet) when I crossed it on July 19th, and was evidently fresh out. It made short flights close to the ground and rested on the bare earth on its side, and was quite easy to catch. On this day fresh snow was falling and lying on the mountains round, almost to the level of the steppe, and the cold perhaps accounted for the comparative sluggishness of the insect.

147. *S. autonoë*, Esp.

This insect came out abundantly about the same time as the last, and was common from the Upper Tchuja Steppe down to about 2000 feet on the Tchulishman river, and also at Ongodai. There is considerable variation both in size and colour, and some of them might be called var. *sibirica*, Stgr., which is described from Kentei as having the transverse band more or less whitish or brownish. This would apply to specimens from Boro-choro in the Thianshan, whilst four pairs from Amdo in North-East Tibet, which I have in Grum-Grshimailo's collection under the name of var. *extrema*, Alph., show this character very strongly developed.

148. *S. anthe*, var. *hanifa*, Nordm.

I found a female from Semipalatinsk, of this form, sent by M. Novoprachin in Staudinger's collection, but of a deeper brown than those from the Caucasus.

149. *S. briseis*, L.

This was very common on the Bashkaus at the end of July at 2000—3000 feet, but not seen anywhere in the Upper Tchuja Valley.

150. *S. dryas*, Scop.

This was very common in the Tchulishman and Bashkaus Valleys, and on comparing it with a large series from Europe, a pair from Kentei, and several pairs from the Amur, I can see no sufficiently constant difference in Siberian specimens to justify the varietal name *sibirica*, which has been applied by Staudinger to those from Kentei, and which he says occur also at Saisan and in Amurland as a more or less common aberration.

151. *S. arethusa*, Esp.

This was taken commonly by Ruckbeil at Saisan, but not observed by myself.

152. *S. cordula*? var. *bryce*, Hubn.

I received three males and a female under the name of *actæa*, var. *bryce*, taken by Ruckbeil near Saisan, and find a pair in Grum-Grshimailo's collection from the Altai, probably taken near Semipalatinsk, under the name var. *altaica*, Gr.-Gr. (Hor. Ent. Ross. xxvii, p. 384, 1893). They agree very fairly both on the upper and undersides with specimens from Sarepta usually known as *bryce*, and differ from *cordula* in the females having no yellowish tinge on the fore-wing below, and the males more mottled with grey below. In both these characters they also agree with those from the Thianshan Mountains, taken by Grum-Grshimailo, whilst all those from the province of Bokhara have the fore-wing below in the female yellowish, like *cordula*.

153. *Pararge mæra*, L.

A worn-out specimen or two were still flying in the Bija Valley at the beginning of August. I did not receive it from Ongodai, but Lederer records it.

154. *P. hieira*, Fabr.

This is an early spring species in Asia. I took one at Biisk on June 4th, and saw two or three more in the foot-hills of the mountains on the 6th. Neither Kindermann nor Ruckbeil seem to have found it, but it occurs in the Kentei Mountains and on the Lena.

155. *P. achine*, Scop.

This was uncommon or nearly over on the Lower Bashkaus and Bija Valleys at the beginning of August, and, as Staudinger says of those from Kentei, seem to be smaller in size than European specimens. It occurs as far north as St. Petersburg.

156. *P. deidamia*, Ev.

A few worn-out specimens were found in a hot rocky gorge in the Tchulishman Valley on July 28th, and I received two or three from Ongodai. This species occurs as far west as the Ural, where Grum-Grshimailo took it in the beginning of June. There is no appreciable difference between these West Siberian specimens. Those from Amdo, however, in Grum-Grshimailo's collection are larger, paler below, and have the white fringes, which are only apparent in quite fresh specimens, much more conspicuous.

157. *Epincphale lycaon*, Rott.

This was the only species of the genus common in the Altai. Specimens from Uliassutai in Mongolia were separated by Staudinger as var. *catamelas* on account of the uniform dark colour of the underside of the hind-wing. This character is, in my specimens, variable, and though on the average it holds good, yet I can pick out some European examples, which are nearly the same on the underside. I have three males and a female collected by Ruckbeil at Kenderlik, a much more southern and probably hotter place than that part of the Altai where I was, which are as pale below as any European specimens.

158. *Epincphale hyperanthus*.

I found this species only in the Lower Bashkaus and Bija Valleys, from about 2000 feet down to the open country at the beginning of August.

159. *Cenonympha adipus*, Fab.

Recorded by Ruckbeil and Lederer, but not seen by me.

160. *Cenonympha iphis*, var. *iphicles*, Stgr., Iris, v, p. 338, var. *heroides*, Christoph. *op. cit.* vi, p. 87. Herz, *op. cit.* xi, p. 248.

I found this species common in the Tchuja and Bashkaus Valleys after July 20th at about 3000—6000 feet. On comparing them with those taken by Herz on the Vilui, by Leder at Irkut, both under the name of *heroides*, Christoph., and with one from Kentei, described by Staudinger as var. *iphicles*, I can find no appreciable differences between them; and though I would have preferred to use the name *heroides* on account of the marked resemblance of this variety to some specimens of *hero*, var. *perseis*, the females especially being very similar, yet as Staudinger's name has a year's priority over Christoph.'s, I adopt it. The differences between this form and *iphis* from Europe are trifling, and two females from the Ural seem to form a transition; but on the whole they are somewhat paler in colour with the ocelli much better marked above, and on the underside of the hind-wing surrounded by confluent rings of fawn colour, which I do not see in any of my European specimens.

C. iphis? var. *mahometana*, Alph., Lep. Kuldja, p. 95 (in separata).

This is a well-marked form from the Thianshan, and was also taken at Kenderlik, a Russian frontier post south-east of Lake Saisan by Ruckbeil; but insects from this locality, though they have been sent out by Tancre as from the Altai, can hardly be included in the fauna of the district as I restrict it.

161. *C. amaryllis*, Cram.

A very abundant species in the lower parts of the country up to about 4000 feet. I took it fresh on June 17th, and it was still flying, though a good deal worn, on July 30th. These specimens are a trifle smaller than those from Pokrofska on the Amur, and the ocelli better marked than in the supposed var. *rinda*, Mén., which I have from Blagoveschenk on the Amur, taken by Hede-mann. Another form taken by Roborowsky and sent to me by Alphéraky as his var. *evanescens* seems to be like

those from Amdo in Grum-Grshimailo's collection, distinguishable by the greater development of the white bands on the hind-wing below.

162. *C. hero*, var. *perseis*, Lederer (cf. Staudinger, *Iris*, v, p. 338. Herz, *op. cit.* xi, 248).

I found this in the Tchuja Valley from 3000—4000 feet, fresh in the middle of June, and in the Upper Bashkaus Valley on July 24th. On the average they differ from the ordinary European form which extends to the Ural in having rather more developed white bands below, and the ocelli more distinct above. The same characters are even more pronounced in specimens from the Amur and Askold, so that perhaps the name of *perseis* may be applied generally to Asiatic races of this species.

163. *C. tiphon*, Rott. var.

I found this species in some of the more marshy parts of the valleys at about 5000—7000 feet. They belong to a form which differs a little from Alpine and North European specimens, of which I have a large series. They come nearest on the upperside to some of those taken in Colorado which are known as *ochracea* and *inornata*, W. H. Edw., but are more spotted on the underside. They are slightly larger and darker in colour than those known as *cæca*, Stgr., from Turkestan; they are paler and about the same size as the average North European forms known as *isis*, and quite unlike the pale grey form known as *viluensis*, Mén., = *grisea*, Christoph (*Iris*, vi, p. 87), which Herz took on the Vilui river (cf. *Iris*, xi, p. 249), and which I also have from the Verchojansk district taken by Czekanowsky, and in a larger and somewhat darker form from Kamtschatka as var. *mixturata*, Alph. Having recently written on the variations of this species in the *Entomologist's Record*, 1896, p. 228, I can only add, that when a large series (my own includes something like one hundred selected pairs from the Holarctic region) are brought together it is practically impossible to define exactly any of these varieties.

164. ? *C. pamphilus*, L.

This is recorded by Lederer as having been taken by Kindermann, but I can find no Altai specimens in Staudinger's collection.

165. *Triphysa phryne*, Pall.

Neither Herz on the Lena nor Dorries in Kentei seem to have found any form of *Triphysa*, but I have specimens from Grum-Grshimailo's collection taken at Krasnoyarsk, and at some place in Northern Siberia, the name of which I cannot decipher. Jacobson also found it common in the Upper Yenesei Valley. The name *Dohrnii* was given by Zeller to a single specimen, locality unknown, which had a whitish border to the wings, and there were a considerable number of specimens in Grum-Grshimailo's collection, taken in the Nan Shan Mountains and the province of Amdo, in which this character is well marked. The females of this form all show two conspicuous black spots on the upperside of the fore-wing, and in some cases have two small black spots above them, but not in line; on the underside the position of these spots is much better seen and is in all the specimens markedly different from those of typical *phryne* from Sarepta, which are in a regular curved series following the line of the outer margin. Four pairs, which were collected by Leder in some part of Northern Mongolia, or perhaps in the Irkut Valley, show these differences in a less marked degree, but I am disposed to separate them at least as a variety from *phryne*. There is also a form described by Erschoff as *albovenosa*, and figured in Rom. Mém. Sur. Lép. II, Pl. XVI, fig. 20, which he says was taken in the Amur Valley far east of Blagoveschenk, which appears to me only a variety of *phryne*, with the spots undeveloped. Staudinger in Rom. Mém. Sur. Lép., vi, p. 208, treats this name as synonym of *nervosa*, Mots., which he puts as probably a variety of *phryne*. *Nervosa* was described from Japan, but as no specimen of any *Triphysa* has reached Europe from Japan, so far as I know, this is probably a mistake. The only female specimen I have from the Amur has no ocelli above on either surface, and only faintly marked ones on the hind-wing below. It appears to me on the whole that there are two or three well-marked forms of this genus; *phryne* extending from Sarepta through the steppes and mountains of Western and Central Siberia to some unknown point, possibly in the longitude of Lake Baikal with a more or less marked variety *albovenosa*, Erschoff, vel. *nervosa*, Mots., from the Amur Valley; secondly, a form extending from Northern Mongolia southerly to the

province of Amdo, which may be called *Dohrnii*, Zell., but which can usually, if not always, be distinguished from *phryne* by the different position as well as the greater development of the four ocelli on the fore-wing. Lastly, there is a form found in the Kuruktagh near Korla, var. *striatula*, Stgr. (? MSS.), which is distinguished by pale longitudinal striations on the fore-wing of the male. This form seems by the position of the spots to belong to *phryne* rather than to *Dohrnii*.

166. *Carcharodus aleæ*, Esp.

I did not secure this species, but it is recorded by Lederer, and I have four specimens from Kenderlik taken by Ruckbeil. Haberhauer also found it at Saisan.

167. *Hesperia orbifer*, Hb.

I received two males of this species from Ongodai, taken by Messrs. Jacobson and Berezowsky. A dark var. known as *lugens*, Stgr., is recorded from the Kentei Mountains.

168. *H. tessellum*, O.

I found this common in the Tchuja Valley at 4000—5000 feet on July 22nd and 23rd in dry rocky places, and received others taken at the beginning of July by Jacobson. I found it also in the Bashkaus Valley.

169. *H. eribrellum*, Ev.

Found in the Tchuja Valley in the middle of June, and in the Bashkaus Valley at the end of July. I also received it from Ongodai. I have specimens from Eastern Mongolia taken by Leder, and Grum-Grshimailo took it at Amdo, and at Turgai in South-Western Siberia. Altai specimens are the typical form and not the darker one var. *obscurior*, Stgr., which is found in the Kentei Mountains and on the Amur.

170. *H. malvæ*, L.

Common at Biisk on June 4th, and at Ongodai and in the Tchuja Valley until the 18th up to 4000 feet, but I did not see it after the latter date.

171. *H. serratula*, Rbr.

I found this in the Tchuja Valley at from 3000—6000 feet in June, and have a single specimen taken at 7000 feet in the Tchuja Mountains on July 11th. I also found it in the Bashkaus Valley at the end of July. I do not

know how to distinguish between this species and the next except by the genitalia of the male (*cf.* Elwes and Edwards' Revision of Oriental *Hesperiidae*, Trans. Zool. Soc. Lond., vol. xiv, part 4, 1897, p. 156; Pl. XXIII, figs. 24, 25, 25a).

172. *H. alveus*, Hubn.

This was very common at Ongodai from June 10th, but I have no specimens certainly belonging to this species from other localities in the Altai. According to Dr. Staudinger's identification of *serratulæ* and *alveus* I have transposed the names, what he calls *serratulæ* being my *alveus* and *vice-versâ*. It seems to me a very difficult question to decide which is right.

173. *H. centaureæ*, Rbr.

This was the only species of *Hesperia* which was at all common in the high Tchuja Mountains, where it occurred from the beginning of June at from 7000—8000 feet. I also took in the Bashkaus Valley at about 5000 feet, flying in marshy places near water, what appears to be this species, and received from Ongodai two or three specimens of what may be a variety of it with the white spots on both wings above much better developed. It was also taken by Leder in the East Sayansk Mountains, but is not recorded from Kentei.

174. *Thanaos tages*, L.

I only found this at one place in the Tchuja Valley at about 4000 feet on June 17th. The specimens do not differ from European ones.

175. *Pamphila palæmon*, Pall.

I did not take this myself, but received a few taken at Ongodai by Jacobson. These belong to the variety described by Christoph as *albiguttata*, which I have from Guberli in the South Ural, from Irkut, and from Kamtschatka. Though this variety appears to be fairly constant in the Altai, it is not so in the Ural, judging by Grun-Grshimailo's specimens. Some from Sutschan in Staudinger's collection also seem to be intermediate.

176. *P. silvius*, Knoch.

This was fairly common at Ongodai on June 13th, and I took it in the Tchuja Valley on June 18th, but did not see it afterwards.

177. *P. argyrostigma*, Ev.

I was very much pleased to find this interesting species, which has not previously been recorded from Western Siberia, common at Ongodai on June 13th, when the males were abundant, but I only got a single female. I found it in the Tehuja and Katuna Valleys from 3000 up to about 5000 feet. It flies very rapidly close to the ground in marshy spots and settles on damp sand or mud. It is apparently very common in North-East Tibet, as there were many specimens from Amdo in Grun-Grshimailo's collection. It also occurs in the East Sayansk and Apfelgebirge (Jablonnoi Mountains), where Dorries took it in 1896.

178. *Heteropterus morpheus*, Pall.

I found this only at one boggy spot by a river in the Bija Valley near Lake Teletskoi on August 2nd, when the species was much worn and nearly over. These examples have less markings on the upperside of the fore-wing than in Europe, and the yellow of the underside appears to be much less developed, but the specimens are not fresh enough to say whether this distinction is constant.

179. *Augiades sylvanus*, Esp.

Small specimens of this species, much worn, were taken near the Teletskoi Lake on July 31st.

180. *Adopæa lineola*, Ochs.

I only found this myself in the Bija Valley at about 1500 feet on August 3rd and 4th, but Berezowsky sent fresh specimens from Ongodai.

181. *Erynnis comma*, L.

I found this only in the Bashkaus Valley at 3000—5000 feet on July 24th and 30th, but judging from the specimens sent to me by Berezowsky and Jacobson, it is common at Ongodai. I see nothing in these specimens to distinguish them from European ones, though Alphéraky separates as var. *mixta* three specimens taken by him at 8000—9000 feet in Kuldja in July.

EXPLANATION OF PLATES XI—XIV.

[See explanation facing the PLATES.]

SEPTEMBER 30, 1899.